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ABSTRACT

A practicum involved the creation of an instructional unit that used a microcomputer and a graphic writing program, Transportation Transformation, to motivate at-risk learners to write (focusing on creative stories) as well as to increase their writing. The target population consisted of fourth graders who were attending Birch Lane Elementary School, Massapequa, New York. The practicum designer created a unit of instruction based on the utilization of the motivating program Transportation Transformation integrated with the reinforcement of a variety of writing skills. The main tasks of the instructional unit involved loading the program, creating a contraption (transportation vehicle), writing a transportation tale, editing the transportation tales, and exiting the program. Implementation of the unit involved a combination of class activity and individual work. Data were collected throughout this stage for utilization in the summative evaluation. All learners thoroughly enjoyed utilizing the software. Truly creative contraptions were constructed where learners far exceeded the minimum performance necessary for completion of the instructional goal. (Fifteen tables of data are included; 25 references, a list of tasks, project planning, checklists, an attitude questionnaire, sample contraptions, a story chart, and sample print sizes are attached.) (RS)

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THE SCHOOL OF MEDIA AND ARTS

of

NEW YORK INSTITUTE OF TECHNOLOGY

announces the

Final Examination

of

Joyce Stegemann Snow

for the degree of

MASTER OF SCIENCE

in

TRAINING AND LEARNING TECHNOLOGY

Transportation Transformation: A Writing Project for At-Risk Students

Abstract

This project represents an examination of the analysis, design, development, implementation, and evaluation of an instructional unit on transportation transformation. It is a writing project for at-risk students. The designer applied the systematic approach outlined in the Instructional Systems Design process in the formulation of learning activities. A complete description of the development process is provided. Recommendations are presented for use by other educators.

Tuesday, August 21, 1990 at 2:30 p.m.

in

Conference Room, French Chateau
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TRANSPORTATION TRANSFORMATION: A WRITING PROJECT FOR AT-RISK STUDENTS

a

THESIS/PROJECT

by

JOYCE STEGEMANN SNOW

submitted to the faculty of the
School of Media and Arts

of

NEW YORK INSTITUTE OF TECHNOLOGY

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

TRAINING AND LEARNING TECHNOLOGY

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TRANSPORTATION TRANSFORMATION: A WRITING PROJECT FOR AT-RISK STUDENTS.

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B.S. 1978, Hofstra University

A Thesis/Project

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CHAPTER 1

INTRODUCTION

Overview

Thirty-five to forty percent of American students in kindergarten through twelfth grade are presently being classified as at-risk. Nationwide, public high schools reflect dropout rates at around twenty-five percent. Urban schools often exhibit a fifty percent dropout rate. The aforementioned statistics are astounding and lead us to the unfortunate conclusion that our present educational system is not properly preparing all Americans to lead happy, productive lives, and that America may soon be considered a nation at-risk if change within our present educational system is not imminent (Roberts, 1988). In recognition of the plight of the at-risk student, the Board of Regents approved the publication and distribution of a working paper which presents suggested strategies for State and local action. The paper describes a variety of elements vital to these strategies and offers examples of programs that implement these elements (Freeborne and Hamer, 1987). Nine vital strategies were incorporated within these elements and are as follows (The University of the State of New York, 1987):

1. All students must be provided with a sense of identity and self-esteem. In order to assure this, each school must educate their students concerning their heritage and afford them the opportunity to experience successful academic and social experiences.

2. The primary focus must be on prevention in which activities

are designed to prevent children from developing problems which put them at-risk. This particular strategy places strong emphasis on pre-school education and emphasizes a developmental approach to teaching children in the early and middle grades.

3. There must be improved identification and assessment of at-risk students, particularly during the early years.

4. Schools must portray a more active role in outreach to out of school youth. This includes special assistance in meeting academic and social needs of the students who are out of school and may desire to complete their educational programs.

5. The identification and dissemination of model programs and services are vital to the increase of completion rates. Assistance should be offered by the State in identifying and adopting these models.

6. All teaching strategies and learning environments should be sensitive to cultural diversity. Instruction should reflect a variety of learning styles and reflect accurate evaluations of student performance.

7. Schools must increase the parent's role in their child's educational programs through development of comprehensive parent education activities.

8. The development of partnerships with businesses, industries and human services within the community to better meet the student's educational and social needs as well as the organizations educational and training needs are essential.

9. Assessment of school programs so that a clear plan for implementing characteristics of effective schools not currently

being applied may be accomplished.

The aforementioned strategies are considered key elements to increase high school completion rates. However, it must be recognized here that there are no simple solutions to this very complex problem.

A serious dilemma faced by a variety of school at-risk programs is that intervention is often too late. Unfortunately, most potential dropouts exhibit multiple problems prior to attending high school. They often lag so far behind that without intensive remedial help a high school diploma may be unattainable. Some may even be discouraged in junior high school and drop out. This suggests a very definite need for intervention on the elementary and pre-school level (Bialo and Sivin, 1989).

Intervention programs can have a strong positive impact on at-risk students and their inherent ability to achieve once they reach school. However, the role of technology in such programs is still evolving. Bialo and Sivin (1989) state that the premise of such "programs is that the computer, offered as one of many optional tools with which a young child is permitted to interact, can be a tremendous resource for teaching pre-reading and math skills, motivating young learners, and providing children from low-income families with access to an exciting environment previously available only to those who could afford home computers."

Background

In response to the at-risk dilemma, technology can play an important role in the reduction of the number of at-risk students. Students are exposed to a self-motivating piece of technology, the

computer, whose inherent possibilities may be applied to such essential areas as problem solving, simulations of real life situations, enhancement of much needed language and math skills as well as an endless number of other vital areas necessary for survival. The computer provides a "fun" way to approach these essential skills thus providing a self-motivating, positive environment in which valuable learning may take place. Learning that positively affects any student would certainly enable that student to thrive thus helping them to be less at-risk.

Benchmark for Implementing the Regents Action Plan (Theyn and Decristofaro, 1986) is a practical handbook for school administrators that specifies the exact requirements that were referenced to in the original Action Plan. A small, yet significant section is devoted solely to the specific requirements of computers within the curriculum. The Action Plan states that all students will acquire skills in the use of computers as the technology is applied to various courses. On the elementary level all syllabi must be updated to incorporate computer literacy and computer technology into the appropriate subjects. It is also suggested that word processing be integrated with instruction on writing (Thyen and Decristofaro, 1986). In response to the aforementioned recommendations, it was essential that innovative curricula be developed within all applicable school districts. Presently, instruction is centered on the following areas; Computer Awareness, Word Processing and Information Processing (data bases). The classroom teacher is an integral part of this educational process by being involved in the selection of viable projects,

working directly with students, and by providing opportunities to utilize technology as a tool in the instructional process in the regular classroom (Massapequa Public Schools, 1988). Software selection is ultimately the teachers responsibility to ensure student success, academic achievement as well as affording the student a sense of empowerment.

Within the classroom, the computer is intended to provide another tool for teachers and pupils to utilize to accomplish the objectives in the regular educational program. Here, the computer's capabilities make it especially well-suited to the needs of at-risk students. Computers can help in the following ways;

1. Provide an alternative to traditional instructional approaches in which at-risk students have experienced failure.

2. May be programmed to be patient and non-judgmental.

3. Affect change in the way students feel about themselves, one another and their teachers.

4. Provides students with a sense of academic privacy.

5. Affords the opportunity for collaboration in a non-competitive academic setting.

6. Provides instructional sequences that are tailored to the individual student.

7. Gives the students a sense of empowerment.

8. Provides a vehicle for open-ended exploration and a means with which one may express varying levels of creativity.

Word processing programs have been immensely successful in that they directly encourage students to write and thereby open up another mode of communication as well as reinforce vital language

skills. Hopefully, this increased utilization of computer technology will encourage the development of curriculum that will be designed to meet the needs of each student thus affording at-risk students the opportunity to develop confidence, survival skills as well as a positive attitude. Thus, this project involves the utilization of a graphic writing program designed to increase student writing and communication skills as well as to ensure a sense of accomplishment at varying academic levels.

Statement of the Problem

Computers can provide a multi-sensory approach to learning. This approach also affords the at-risk student a viable alternative to traditional instruction in which students may have previously experienced failure. This project was in response to this need for increased computer utilization within the educational system. It aimed to explore the beneficial attributes in the utilization of a graphic writing program with respect to writing and communication skills as it applied to students at varying academic levels of achievement and motivation. Lack of writing skills as well as an inability to express ideas, thoughts and concepts were prominent problems addressed also within this project.

Purpose of the Project

The purpose of this project was to motivate students to compose well-written creative stories as well as to design appropriate coordinating graphics. It was also designed to increase the students ability to communicate thoughts, concepts and ideas through the utilization of a computer and an innovative piece of

software. The creation of a document which included preparation from an original main idea, supporting statements, proofreading, editing as well as final revision of the finished product was also incorporated. This project was also designed for a wide spectrum of academic levels. Enrichment as well as remediation techniques were incorporated within its structure.

Definition of Terms

The following terms were utilized throughout this project and require further definition.

1. At-Risk Student: Ellen Bialo and Jay Sivin (1989) accurately describe at-risk students as frequently possessing the following attributes:

    a. students with serious deficiencies in their basic skills- who fall two or more years below grade level. Included in these groups are many ESL/bilingual and special education students.
    b. students who are unmotivated by their class work.
    c. students who have had disciplinary problems, have been suspended, or have been put on probation.
    d. students with poor attendance records.
    e. students who get pregnant or who get married while in high school.
    f. students who for economic reasons must work.
    g. students with family problems.
    h. drug and alcohol abusers.
    i. minority students.

2. Word Processing: The creation and manipulation of text

which allows you to store documents on disks and recall them later for revision or printing.

3. Graphic Writing Program: The incorporation of text and graphics (pictures) within an innovative software program.

4. Transportation Transformation: This is a graphic writing program presented by Learning Lab through PELICAN Software Inc. Transportation Transformation includes a double sided disk packed with hundreds of colorful graphics and a built-in text processor, five unique printing sizes, a color printing option as well as compatibility with a variety of printers and interface cards.

5. Contraption: A transportation vehicle that is created by the student through utilization of the program Transportation Transformation which includes a background, body, wheels and driver.

6. Transportation Tale: A story designed to accompany each Contraption.

7. Computer: The computers utilized throughout this project were Apple IIE's which included a monitor, keyboard, central processing unit (CPU), two five and a quarter disk drives and a Panasonic 1091i or Imagewriter II printer.

Assumptions

1. That the participating students are fourth graders who do not have to be presently functioning at any particular academic level due to the adaptability of the software program.

2. That the students have prior knowledge and experience in the utilization of computers as well as various software programs. This includes the ability to load a software program, manipulate

various menus within the program, save, retrieve and print files. The student must also possess basic word processing skills.

Limitations

1. That the instruction described within this project was designed for fourth graders currently attending Birch Lane Elementary School, Massapequa Park, New York and may or may not be applicable to other levels of instruction without further modification.

Method and Procedures

Instructional System Design was the method utilized throughout this instructional unit as a basis for analysis, design, development, implementation and evaluation of this project. Dick and Carey (1985) provided vital guidance for the utilization of this approach within this project. Analysis provided the method to define the specific need addressed by this project. Design utilized the prior knowledge attained in the analysis phase to specify the exact skills, knowledge and attitudes that were to be attained at the conclusion of the instruction unit. Development formed the basis for the ultimate organization of all instructional materials necessary for the student's achievement of the instructional goal. Implementation involved the actual process of utilizing the instructional unit as previously planned. Evaluation was designed to ensure the attainment of the applicable instructional goal (Dick and Carey, 1985). The aforementioned Instructional System Design model was specifically utilized within this project as stated in the following sections.

Analysis

Through specific analysis procedures a very definite need was established thus facilitating change within the present mode of instruction. This was determined as a result of thorough investigation by the designer of various existing curricula to further refine the scope of the response for this need. Various professionals were consulted. Supervisors, parents and learners were also interviewed to further define the need. Data ascertained from the above procedures supported the designers establishment of the necessity for further instruction. Once this desire was established, a clear instructional goal was formed with very specific desired outcomes.

Design

At this stage of the Instructional System Design model, performance objectives were established which reflected the task performance information ascertained during the analysis phase. Specific assistance in the creation of clear, concise objectives which directly reflected a description of the desired performance, conditions and criteria was given by Mager (1984). Once these objectives were established a reorganization was necessary in order to ensure the proper sequence of instruction. A checklist was utilized to ascertain student performance and a clear instructional strategy was established.

Development

Gagne's (1985) nine instructional events were the basis for the ultimate development of the instructional unit. Facilitation of the teacher as well as the design of this instructional unit

reflected each of the nine instructional events. Various media, methods and materials were utilized within this instructional unit. Apple IIE computer set-ups, including two 5.25 inch disk drives as well as a Panasonic 1091i or Imagewriter II printer, a large television monitor, printed materials, and appropriate software were vital to the success of the unit. A graphic writing program entitled Transportation Transformation was utilized throughout this project. Anderson (1983) provided the primary source for the proper selection of various media for instruction.

Implementation

The implementation portion of this project was separated into three sections encompassing instructional materials, instructional delivery and data collection. Appropriate instructional materials were chosen carefully to ensure the unit's success. Instructional delivery was planned to secure a smooth transition from lesson to lesson as well as to facilitate the desired instructional goal. Data collection was based on the utilization of an attitude questionnaire that was sub-divided into six separate levels of evaluation entitled motivation, objectives, entry behaviors, tests, instruction, and general. Two checklists were employed to ascertain student performance. Further data was collected through feedback from other professionals and direct observation.

Evaluation

Evaluation consisted of assessment on both the formative and summative levels. The formative evaluation was conducted in three different phases. Five one-on-one trials, two small group trials

and one field trial was conducted. Any relevant information ascertained throughout these trials were designed to aid in the revision and ultimate improvement of the instructional unit (Gagne, 1985). Through the utilization of an attitude questionnaire as well as two separate checklists, accurate evaluations were concluded and a successful unit of instruction was constructed. The summative evaluation consisted of accurate assessment on four separate levels. These four levels are those as described by Kirkpatrick (1983) and are as follows: reaction, learning, behavior and results. Each of these levels were evaluated thoroughly and provided accurate data to support the further utilization of this instructional unit on a broader scale.

Summary

The plight of the at-risk student is an issue that most definitely needs to be addressed more thoroughly. Any method of teaching that facilitates the improvement of student attitudes, encourages success in a positive, beneficial environment as well as facilitates the achievement of academic improvement is certainly worthy of further exploration. Such is the utilization of technology within the classroom, specifically the computer. This project addressed the application of this innovative piece of technology as it applies to the classroom situation through the utilization of a graphic writing program. Accurate analysis of the problem, design of appropriate task performance analysis, development of instructional materials necessary for the achievement of the learning objectives, implementation of the unit as well as the final comprehensive evaluation was conducted. This

resulted in the production of a successful unit of instruction that can be applied to a variety of learning situations. Hopefully, this increased awareness of the beneficial characteristics of computer utilization will facilitate its increased use thereby reducing the overwhelming at-risk statistics that we are presently confronting.

CHAPTER 2

ANALYSIS

Introduction

Analysis is an important factor in the development of any new form of instructional unit. As stated within the Instructional System Designs (ISD) model, thorough analysis provides a precise method by which one can establish the existence or non-existence of an instructional need (Dick and Carey, 1978). As soon as one can demonstrate that a need does in fact exist, then a thorough examination of the required performance objectives that are required to meet the need can be examined.

A job task analysis must be thoroughly undertaken to ensure the development of a clear, concise unit of instruction in which all of the tasks directly fulfill the requirements of the need. Sub-tasks must support the primary tasks. Once the needs analysis and job task analysis are completed, the designer may proceed to the next area of analysis.

An intensive target population analysis provides the guidance a designer needs to ensure the proper design and development of a successful instructional unit. The more specific this analysis becomes, the more directed the design becomes. Questionnaires, discussions, examinations of research data as well as relevant observations enable a designer to further refine the scope of analysis.

The success of the instructional unit also depends upon a clear statement of the instructional goal. The goal is researched

through a variety of information processing methods. Literature reviews, existing curriculum, and related theories all support the further development of the instructional goal and thereby also supports the unit. A well developed project plan is also essential as well as a descriptive financial budget.

Needs Analysis

In order to determine that an instructional need does in fact exist, the area of instruction must be fully researched to determine if there is a very definite discrepancy between actual and desired performance. According to the Regents Action Plan, all elementary education curriculum must be updated to incorporate computer literacy and computer technology into the appropriate subjects. It is suggested that word processing be included with instruction on writing (Decristofaro and Theyn, 1986). In compliance with the previously mentioned plan, this unit of instruction was designed. It was designed to motivate students to write and to increase their writing skills through the utilization of a graphic writing program and a computer. In order to ensure an accurate design of instruction, a comprehensive job task analysis and target population analysis was essential. A recognition of any applicable necessary organizational restraints was acknowledged and stated as follows.

Job Task Analysis

The instructional unit developed here consisted of six main tasks as well as their accompanying sub-tasks. These sub-tasks were required steps of instruction to ensure that the main tasks were accomplished successfully. The main tasks were identified as

follows:

1.0 Load the program

2.0 Create a Contraption (transportation vehicle)

3.0 Write a Transportation Tale

4.0 Evaluate the Transportation Tale

5.0 Edit the Transportation Tale

6.0 Exit the Program

Steps required for the completion of each of the main tasks as well as the accompanying sub tasks may be found in Appendix A.

Target Population Analysis

Various data was ascertained through a variety of modes of analysis so that an accurate assessment of the target population was available to ensure the success of the instructional unit. Initial data was ascertained through discussion with students via a pre-conceived series of questions. Additional information was extracted via discussion with other professional teachers. Specific data was also ascertained directly from each student's permanent records. Testing results were transcribed from these records that specified the exact grade level of competency for each student. This included specific testing in reading and math as well as a general assessment of the complete battery of tests. Also, each student's I.Q. was recorded as well as any weak areas that were apparent from a previous teacher's written assessment. This assessment was written at the end of the previous school year in hopes of giving the student's next teacher some added insight into any areas needing extra attention. Details were also recorded specifying as to whether a student was enrolled in a remedial

reading program, had a learning disability or attended special education classes.

The learners for this instructional unit initially consisted of twenty three fourth graders who were attending Birch Lane Elementary School, Massapequa, New York. Twenty one of these learners were functioning at or above grade level. The competency tests and general ability ratings specifically supported this data. As stated by their present teacher, the test scores were consistent with present classroom performance. I.Q. ratings ranged from 91 through 124 with a majority of the students falling between the interval of 100 and 120. Six of the learners attended remedial reading classes. One had a specific learning disability and one attended special classes for a portion of the classroom day. As supported by the aforementioned data, it was clear that a majority of the learners exhibited verbal and numerical capabilities at their applicable grade level or slightly higher.

From individual interviews, the designer was also able to ascertain that the aforementioned group of learners were representative of a very active group of children. Most were involved regularly in some sort of physical activity. This aided the designer in that the learners exemplified competence in various levels of psychomotor development. This directly affected instruction in that psychomotor skills were an integral part of it.

Accurate assessment enabled the designer to plan instruction that provided specific, clear directions thus ensuring the success of those students with reading disabilities. It also allowed for the development of an instructional unit that directly provided for

the inherent differences among the students as well as their varied academic abilities.

Organizational Constraints

The computer was utilized as a powerful tool designed to motivate students to increase their writing skills. This coupled with a graphic writing program ensured the success of the instructional unit. Anderson (1983) states that the computer has the potential to become a dominant medium in the field of instruction. It has become more common for computers to be used in a variety of instructional activities which includes the production of graphic media as well as word processing systems (Anderson, 1983). Therefore, based on Anderson's media selection process, computer utilization was selected as a medium for ensuring the success of the instructional unit. Apple IIE computers, monitors, 5.25 disk drives, and Panasonic printers were utilized with the software program Transportation Transformation. These were easily accessible and readily available. A television monitor was also utilized for demonstration purposes.

Restraints of a mechanical nature must be cited here. Computers, as sophisticated as they may be, were often prone to a variety of mechanical difficulties. A printer that was not functioning properly as a result of an inconsistency in the software program provided a temporary setback during one of the lessons. These problems can surface at any time during instruction. Therefore, a complete check up of all hardware to be utilized was suggested.

Instructional Goal

Given the graphic writing program "Transportation Transformation", the student will build a contraption (transportation vehicle) and will write a completed Transportation Tale. The Tale must be proofed, edited, saved and printed.

Literature, Existing Course, and Material Review

The ensuing three sections offer data relating to relevant literature, related theory as well as a survey of existing courses and materials. Each offers a multitude of research information applicable to the success of this project.

Related Theory

A listing of all theories applicable to this project are included in the following section. Gagne's learning domains and Piaget's learning stages are included for discussion. A major portion of this section also reviews the Regents Action Plan as well as its implementations for the future.

Gagne's (1978) domains of learning enable a designer to classify a specific goal in order to aide in the identification of an appropriate instructional analysis technique. The first learning domain encompasses activities that involve mental and physical ability. Psychomotor skills (Bloom, 1956) reflect these abilities which also involve a variety of muscular actions, possibly involving the utilization of equipment to achieve some very specific results. The ability to utilize a computer involves a variety of psychomotor skills thus enabling a learner to manipulate a viable piece of equipment to achieve the desired results which is reflected in the achievement of the instructional

goal.

The second learning domain involves intellectual skills. Intellectual skills require the learner to be engaged in some unique cognitive activity (Bloom, 1956). Four types of skills are classified throughout this learning domain as follows: discriminations, concepts, rules, and problem solving. Each demonstrates that a learner knows how to do something or knows how to apply a procedure to another experience. The application of a new computer program involves a substantial utilization of intellectual skills as well as writing in which verbs must agree with their corresponding subjects and a multitude of other language applications.

Verbal information is the third learning domain. Here, the learner must provide specific responses to some very specific stimuli which are often manifested in lists as well as in the actual stating or description of something. Listing the essential keys on the computer keyboard as well as their functions, describing the steps in the creation of a contraption, and stating the proper steps to edit a writing sample are all examples of verbal information goals.

The final learning domain, attitudes, deals with the learner choosing to do something a certain way. Attitude goals are difficult to assess in that they are not usually achieved at the completion of instruction. These goals are often difficult to evaluate in that they reflect long term goals. The choice of learners to write more often as a result of instruction is a viable reflection of an attitudinal change.

Huber (1985) relates Piaget's studies of intellectual behaviors of children to the child's ability to explore and manipulate the computer. A child's developmental level determines the computer activities and concepts that are appropriate for that particular grade level. This computer experience can also stimulate the development of a child's mental patterns.

Piaget divides behavior into three stages as follows: pre-operational, concrete operational, and formal operational. In the pre-operational stage, the child is operating on the level of symbolic representation in which thinking is dominated by static mental images rather than mental representations of change. These static images do not allow a child to think of more than one thing at a time. The young child cannot envision the whole group and its parts at the same time. This can be related to computer utilization in that many children have related problems when trying to utilize word processing programs. They are not equipped to remember a variety of different modes within the programs. When a child is using one mode, it is often difficult to recall the other mode.

The second stage is entitled the concrete operational stage. During this stage, direct experience with LOGO can be a valuable learning experience that enhances the transition to the next level of intellectual development. Here, a child only is able to comprehend what is in the world around them. It is the world of LOGO that enables them to experience how a perceptual whole is composed of separate elements. Logical thinking in relation to experience as well as the ability to manipulate variables are

evident at this stage as well as throughout the LOGO program.

Formal operations begin when a youngster is approximately eleven years old. The child begins to be able to reason logically about abstract propositions, things, or properties which have not been directly experienced. A variety of software is offered which encourages the application of logical thinking.

Benchmark for Implementing the Regents Action Plan is a publication designed as a practical handbook for school administrators (Theyn and Descristofaro, 1986). It is published by the Principal's Library in both Huntington and Massapequa Park. The handbook is separated into a variety of sections which briefly describe the Regents Action Plan for that particular area. One of these sections deals with Computers. The handbook states that the students must acquire skills in the utilization of computers as it directly applies to a variety of courses. Specifically, on the elementary level all curriculum must be updated to integrate computer literacy and computer technology into all appropriate areas. Word processing must be included within instruction on writing, problem solving within mathematics and logic, and information search skills must be integrated within a variety of subjects.

Literature Review

Related literature was ascertained through a variety of research methods. The utilization of the ERIC (Educational Research Information Center) enabled the designer to search for specific data pertinent to the instructional unit. Writing, high risk, at-risk, dropouts, microcomputers, computer assisted

instruction, primary education, elementary education, early childhood education, elementary school students, word processing, computer graphics and creative writing were all descriptors utilized throughout the ERIC search.

1. Carter, S. (1987). Writing with microcomputers in the elementary grades: Process, roles, attitudes, and products. Education and Technology Series.

This article reflects a report of a study which was designed to examine and compare writing with and without microcomputers in the elementary classroom. The study examined the following: the difference between writing instruction with and without a computer, the process of teaching writing, teacher attitudes, student attitudes, and reading scores of all learners involved. Subjects were comprised of a group of ninety teachers and one hundred eighty students. Students were from grades one, three and six and were divided equally into three control and three experimental groups, according to grade level. All control groups utilized traditional writing methods while the experimental group utilized microcomputers for writing. The findings indicated that the elementary school children did increase and improve their writing skills. Documentation, charts and figures are attached to this article supporting the findings.

2. Dudley-Marling, C.C. (1984). Microcomputers, reading, and writing: Alternatives to drill and practice.

This article discusses the utilization of the computer as a tool that can encourage the discovery that written language is purposeful, meaningful, and worthwhile. It also impresses upon the

reader that students need to experience this discovery through meaningful demonstrations of writing and that they ought to have frequent opportunities to write in purposeful ways.

Word processing is discussed as a possible motivating factor to stimulate and increase writing skills. Ease of editing procedures is cited as a major factor in the production of writing samples that are well written and involve more detailed writing. A significant advantage of word processors is that they encourage the view of writing as a viable process.

3. Heffron, K. (1986). Literacy with the computer. The Reading Teacher, pp. 152-155.

Writing development involves constant change and revision. Word processing makes it relatively simple for students to adapt and improve their text until they have achieved the desired results. In response to the aforementioned, this article explores the freedom that word processing affords the writer; the ability to take more risks, to focus more on meaning, to organize and choose word choices more freely. Because of the great potential for adapting text, a variety of word processors aid the students awareness of the actual learning process. In essence, the computer helps the writer to understand that learning is an active process. This is possible in that phrases, sentences, and paragraphs can be easily moved around within a document. At any time, a version can be printed for easy editing or for future learning and enjoyment. The computer enables the student to take academic risks and increase their awareness of their abilities as writers and authors. Word processing also enables the student to be in complete control

of their learning.

This also article explores the integration of word processing with other subject areas. Specific successful projects are suggested as well as applicable software. Future developments for computer utilization within the reading and writing curriculum is discussed.

4. Hoot, J.L. and Kimler, M. (1987). Early childhood classrooms and computers: Programs with promise.

Word processing and LOGO are the main points of discussion within this article. Based upon recent research, the application of computers as learning tools within the classroom when applied with word processing and LOGO have achieved beneficial results. The article also cites that word processing programs can support beginning writers in a variety of ways. Word processing programs can very often provide visual, motor, and auditory supports for learners. They encourage the learner to write more in the absence of mechanical drudgery thus enabling the learner to focus on the content of writing. Word processing provides the learners with the opportunity to revise text easily which leads to a more positive attitude about writing that permeates all curriculum areas. Finally, the future development of word processing programs is discussed.

5. Kurth, R.J. (1988). Process variables in writing instruction using word processing, word processing with voice synthesis, and no word processing in second grade.

The main objective of this study was to examine specific process variables that occur as elementary grade students were

taught writing skills using word processing, word processing with voice synthesis, and no word processing. Forty-five second grade students were divided into three groups based on previously administered comprehension tests. Average, below average, and above average students were equally distributed within the three groups. The primary group was taught writing utilizing a word processor. A secondary group was taught writing with word processing and a synthesizer. The final group was taught without the utilization of any word processing equipment. Data was analyzed in some of the following areas: composition length, composition quality, invented spellings, peer interaction, writing and editing, development of collaborative skills, influence of peer writers, developing a sense of audience, persistence when writing, and function of the voice synthesizer. Results for this study indicated that the learners can produce quality writing in any of the above settings. However, the study also stated that word processing can relieve learners from the difficulties and frustrations of manuscript writing.

6. Pon, K. (1988). Process writing in the one-computer classroom. The Computing Teacher, pp. 33-37.

This article divides the writing process into four specific steps as follows; prewriting, writing, editing/revising, and publishing. Prewriting entails the utilization of a variety of activities designed to guide the students in their writing selection. Brainstorming, clustering of ideas, research and participation in sensory experiences also aide the student in the prewriting stage. The computer enables a student to tackle these

prewriting activities with great ease. Brainstorming is the easiest in that students can simply toss out a variety of ideas using the computer without worrying about their classifications. Clustering, which is a way of listing ideas by grouping them in categories can be encouraged when utilizing a computer in that the insertion of new ideas can be easily accomplished. Students can easily list ideas under each topic and are afforded the mobility to move within a variety of groups.

The next phase is that of writing. Conflicting opinions are reflected in this article as to whether this phase should be completed solely at the computer or not. On the elementary level, it is stated that most students do not possess the appropriate keyboarding skills needed to generate text quickly. Therefore, it is suggested that most writing at this stage be done with paper and pencil. Most classrooms only have one computer available for student use further complicating the adaptability of this phase of the writing process at the computer.

Editing provides feedback from another source in response to the writing. This involves text revision and a clear evaluation of what has been written. A partial evaluation may also be offered via a peer check. Once a peer evaluation has been completed, then the writing is usually ready for teacher evaluation. The key to this entire process is to offer students practice in editing.

The final stage, publishing, involves decisions about the final appearance of the writing assignment. These decisions include choices that involve a specific font or the availability of graphics. A comprehensive list of innovative suggestions is

offered within this article.

7. Roberts, J. (1988). Technology and the at-risk student. Electronic Learning, pp. 35-49.

Statistically, this article reveals that an astounding thirty-five to forty percent of all Americans now registered in kindergarten through twelfth grades are currently being classified as at-risk. It discusses the need for change within our present educational system as well as factors that may assist a potentially at-risk student.

This article also deals with the important role that technology can play in the reduction of at-risk students. Technology succeeds in mastering this by providing positive environments in which the dropouts and potential dropouts can thrive. As stated in this article, technology succeeds in offering the at-risk student an opportunity to succeed.

A definition of at-risk is also generated and specific examples of how technology is making a difference are offered. Specific software is also suggested that has ben successful at the present time in various educational settings with at-risk students. Word processing programs are immensely successful in that they directly encourage students to write and thereby open up another mode of communication for them. Suggestions are also made in order to ensure a future free of at-risk students.

Survey of Existing Courses and Materials

The following section reports on the research of a variety of curriculum applicable to this project. Four curriculum guides were chosen as essential to this project and are reviewed in subsequent

selections.

1. Curriculum Guide (1988), Computer Education, Massapequa Public Schools, Grades 1-6.

This curriculum guide contains a brief outline for computer education on the elementary level, grades one through six. The computer lab instruction is divided into three main areas as follows: Computer Awareness, Word processing and Information Processing (Data Bases). Computer Awareness includes the care and use of the computer as well as the recognition of all applicable keys currently on a QWERTY keyboard. A variety of terms related to hardware and software including the identification of all components of a computer system are included. Students are also given lessons in relation to how a computer works.

Word processing skills are emphasized throughout all grade levels which includes the utilization of menu-driven programs, editing procedures, computer generated dictionaries and thesauruses. A variety of software is suggested. Data Base instruction is included for fourth and fifth grade students only. This involves the utilization of existing data bases to manipulate a multitude of data. Once again applicable software is suggested. Additional skills designed for enrichment are as follows: numerical processing, programming, simulations, and desktop publishing. These are accompanied by suggested software.

2. Curriculum Guide, South Huntington Union Free School District, Interdisciplinary Literacy Instructional Program.

The Interdisciplinary Computer Literacy Instructional Program (ICLIP) is designed for utilization on each of six elementary grade

levels. It is organized and presented so that the teacher will be able to integrate the computer within the present curriculum. The curriculum is arranged into three areas as follows: Teaching ABOUT the Computer, Teaching WITH the Computer, and Teaching THE Computer. Technological, historical, and social aspects of computer literacy are encompassed within the section entitled Teaching ABOUT the Computer. Teaching THE Computer utilizes the computer as a discovery and problem solving device. The final area, Teaching WITH the Computer deals with the utilization of the computer as a teaching tool designed to reinforce a variety of curriculum areas.

The teacher's guide itself is divided into two sections in which the first consists of a series of lesson plans. A second section lists software programs specific to the guide's grade level.

3. Office of Elementary and Secondary Planning, Testing and Technological Services, Division of Elementary & Secondary Education Planning Bureau of Technology Applications, (1989). Resource Manual on the Use of Computers in Schooling.

The University of the State of New York, The State Education Department has developed a resource manual related to the utilization of computers in schooling. It is designed to provide educators with relevant information on the use of computers and any related technology within the school system. The manual itself is sub-divided into five major sections. Section I includes a review of the goals, functions, major programs and activities of the Bureau of Technology Applications. It also includes a description

of the Model Schools Program as well as a series of perspectives and initiatives on the utilization of computers. Section II describes relevant technology programs in New York State and name contact persons for further information. The third section describes distance learning. It also examines the planning and implementation of distance learning projects. Section IV contains a description of the National Diffusion Network (NDN) which involves the utilization of technology for instructional purposes. A variety of programs are described. Finally, Section V contains a complete glossary of terms frequently utilized within this manual.

4. The Technology Lighthouse of the Merrimack Education Center, (1984). Computer Applications Planning, A Guide to Planning and Implementing A District-Wide Computer Program.

This guide is utilized as a frame with which to plan and integrate new learning technologies within the current educational system. It is intended to be an aide in the transition from technology exploration to comprehensive planning and development. The guide is organized according to the five major steps in the development stage. The first step involves planning for technological change and offers a variety of preliminary activities. Integration of the computers within the curriculum is the primary concern of the second step. A third step explores the need for staff development and training. Step four deals directly with the acquisition of all applicable hardware and software. The final step explores organization and implementation of the new program. Resource needs as well as a budget plan are included for future planning. A list of resources is also available which

includes relevant documents, data collections forms, and any related materials.

Plan for Design and Development Effort

The following section states information that delivers specific details in relation to the estimated student effort necessary throughout the project. It also includes a brief description of the project plan itself, as well as an estimation of the budget planning. These sections are designed to give further incite into the design, development and eventual implementation of the project.

Estimated Student Effort

The estimated student effort comprised a maximum total of four hours of instructional time. An entry behaviors test constituted the primary forty minute period. Four forty minute time periods were allotted for completion of the majority of the instructional unit. A final forty minute period was encompassed to allow for enrichment as well as remediation.

Project Plan

Proper planning enabled the designer to remain on schedule and develop realistic goals. A major portion of this planning involved the utilization of a Time Line that was developed by the designer at the onset of the project. Also developed by the designer was a PERT (Program Evaluation and Review Technique) Chart. These both may be found in Appendix B.

Students participated within this instructional unit for six classes each forty minutes long. This time frame allowed the maximum time allotted for successful completion of the unit. Fortunately the software program utilized was applicable to all

ability levels of the learners. Those needing enrichment were able to use further activities accompanying the program. Students needing remediation were able to successfully complete the instructional unit with confidence within the time allotted. This successful integration of a graphic writing program coupled with basic writing skills produced a noteworthy unit of instruction.

Budget

The budget was prepared to give an indication as to the applicable cost of the analysis, design, development, and evaluation of the instructional unit. However, these figures reflected a one time cost which did not effectively reflect the cost of the actual program. Anyone implementing this program would therefore incur a considerably smaller budget.

The salary for the instructor was based on the current average teacher salary. Each forty-minute period was calculated to incur salary costs of thirty-five dollars.

The cost of a computer work station was not included within this budget in that it was already accessible and available within the district. If the purchase of a computer set-up became necessary, then the budget would need to be adjusted accordingly. A computer set-up consisting of a computer, monitor, keyboard, disk drive, and printer would cost approximately two thousand dollars. This figure would then have to be added to the budget reflected in Table 1.

Summary

This chapter was designed to explore a multitude of information viable to the successful design, development and implementation of

this project. Initially, analysis began by determining a need for increased computer utilization coupled with writing instruction. Once this need was established, a job task analysis was generated identifying six main tasks as well as accompanying sub-tasks necessary for fulfillment of this need. A thorough target

Table 1

Budget for Instructional Program

Expense	Hours	Cost	Subtotal	Total
Labor @ $35.00 per hour				
Analysis	25	$ 875.00		
Design	35	1225.00		
Development	35	1225.00		
Field Trials	7	245.00		
Revision	4	140.00		
Implementation	30	1050.00		
Evaluation	30	1050.00		
Total Labor			$ 5810.00	
Materials				
Teacher-made materials		25.00		
Classroom Supplies		100.00		
Stationary		350.00		
Total Materials			$ 475.00	
Grand Total				$ 6,285.00

population analysis was completed and reported within this chapter. Accurate assessment of the target population enabled the designer to devise specific instruction suitable for the success of the unit. Organizational constraints were also included.

In order to ensure the development of a clear, concise

instructional goal, a variety of data was collected via literature, related theories, material reviews, and other research methods. Once the research was completed, a clear plan for the design and development was undertaken. Project plans which specified the time limitations expected both for the designer as well as project implementation were included. The budget specified the approximate monetary figures necessary for the analysis, design, development, implementation, and evaluation of this project. Additional costs were included for those not accessible to any computer lab stations.

CHAPTER 3

DESIGN

Introduction

The appropriate design of any instructional unit depends upon the clarity of that design. It initially involves the thorough analysis of any applicable instructional tasks. These tasks, once accurately assessed, must then be analyzed and sub-tasks can then be formed. The formation of these tasks enables the designer to subsequently write instructional objectives to accompany each one to ensure the clarity of design. A valid assessment of all applicable entry behaviors must also be undertaken.

Upon completion of the task analysis, the designer can then begin to sequence and organize the unit of instruction. A logical sequence of instruction in which each step is placed in groups and sequences enables the development of a well designed project.

A thorough examination of each of the learning activities must be undertaken in which the content, instructional method and media are included for each activity. Assessment is also essential in that a designer must specify the data to be collected, how it will be utilized, evaluated and applied. Formative and summative evaluations enable the designer to establish a clear assessment of the unit of instruction. These evaluations coupled with data relevant to the transfer of learning as well as information ascertained from notable sources enable the design of a successful unit of instruction.

Instructional Task Analysis

A major portion of the second chapter dealt directly with the definition of the instructional goal as well as the ensuing job task analysis. The results of these analyses evolved into a viable list of tasks or subordinate skills that the learner must master in order to perform efficiently the instructional goal (Dick and Carey, 1985). Six main tasks were identified as essential to the ultimate accomplishment of the instructional goal. A viable list of subordinate tasks was then generated through the utilization of procedural and hierarchical analysis techniques (Dick and Carey, 1985). The previously mentioned analysis techniques provided the designer with a firm basis for the further design of instruction. A thorough task analysis may be found in Appendix A.

Instructional Objectives

Mager (1984) states that an objective is a clear description of a performance you want the learners to be able to exhibit before you consider them competent. Objectives also describe the intended result of instruction instead of the process of the instruction itself. It is essential that any objective be as clear and concise as possible to ensure the ultimate achievement of the instructional goal. Objectives may then provide a sound basis for the selection or designing of instructional content and procedures, for evaluating or assessing the success of the instruction, and for organizing the students' own efforts and activities for the accomplishment of the important instructional intents (Mager, 1984).

There are three main characteristics that help make an

objective communicate an intent. The characteristics are performance, conditions and criterion. The performance characteristic states what a learner is expected to be able to do. Thus, the objective very often describes the product or result of doing. Conditions describe the important conditions under which the performance is to occur. A criterion is the standard by which performance is evaluated which must include the description of how well the learner must perform in order to be considered acceptable (Mager, 1984). With this solid basis for writing objectives the designer identified performance objectives for each of the six main tasks as well as for the subordinate skills. The objectives are listed in the following section.

1.0 Given an Apple IIE Computer and a specific piece of software, Transportation Transformation, load the software into the computer. The words Transportation Transformation must appear on the monitor.

2.0 Given an Apple IIE Computer with a 5.25 disk drive and the loaded graphic writing program Transportation Transformation, create a contraption. (transportation vehicle) The contraption must include one background and at least three body shop parts.

3.0 Given an Apple IIE Computer and the loaded program Transportation Transformation, write a completed Transportation Tale. An ordered series of complete sentences with correct punctuation must be written.

4.0 Given an Apple IIE Computer, the loaded software program Transportation Transformation and a completed draft of the Transportation Tale, evaluate the Tale. The Tale must be proof-

read. Incorrect words and sentences must be identified.

5.0 Given an Apple IIE Computer, the loaded software program Transportation Transformation and completed proof-read draft of the Tale, make corrections using basic editing procedures: delete and insert.

6.0 Given an Apple IIE Computer, the loaded software program Transportation Transformation and a completed Transportation Tale, quit the program. The software must be extracted from the disk drive and no power lights must be on.

Entry Behaviors Defined

Entry behaviors are defined as the skills that the learners must have before they actually begin instruction. The definition of these behaviors are critical to the design of effective instruction (Dick and Carey, 1985). A list of entry skills crucial to this instructional were identified and are reported in the ensuing section.

1. Open the disk drive door
2. Place the disk into the disk drive door
3. Close the disk drive door
4. Turn on the monitor
5. Turn on the computer
6. Describe the main menu and it functions
7. Locate specific keys on the keyboard
8. Identify complete and incomplete sentences
9. Save
10. Print
11. Quit

12. Turn off the monitor

13. Turn off the computer

Group and Sequence Objectives

The six main instructional objectives were placed in order according to their appropriate position within the design of the instructional unit. This logical sequence enabled the designer to cluster the objectives into daily lesson plans as well as to specify the desired learning time. The following chart illustrates the grouping of objectives into a smooth instructional package. It also includes the time necessary for successful completion of the instructional unit.

Objective one and six as well as their corresponding subskills were tasks that were required for the successful completion of every daily lesson. The logical ordering of the remaining objectives were simply a matter of procedural analysis. Objective two, which involved the creation of a contraption (transportation vehicle) had to be completed before objective three which encompassed the initial planning for the transportation tale. It was impossible for the tale to be written before the contraption was completed since the story or tale was about the contraption. Once the first draft of the transportation tale was completed, a natural sequence of proof-reading and editing procedures were undertaken. Any other order would have proved the instruction to be inadequate and ill planned. The logical sequence of these objectives may be found in Appendix A.

Learning Activities Specification

The instructional activities undertaken within this unit

Table 2

Sequence and Cluster Objectives

Subskill Number	Learning Time
Lesson 1	
Entry Behaviors Test	40 Minutes
Lesson 2	
Objectives 2.0 2.1 2.2 2.3	40 minutes
Lesson 3	
Objectives 3.0 3.1 3.2 3.3 3.4 3.5 3.6	80 minutes
Lesson 4	
Objectives 4.0 4.1 4.2 4.3 4.4 4.5 4.6 5.0 5.1 5.2 5.3 5.4	40 minutes
Lesson 5	
Enrichment and Remediation	40 minutes

directly followed the theory of instruction as stated by Gagne

(1985). Gagne (1985) surmised that a theory of instruction should attempt to directly relate the external events of the instruction to the outcomes of learning by showing exactly how these events lead to either appropriate support or relevant enhancement of the internal learning processes. Upon this basis, a theory of instruction evolved in which internal processes were directly related to their corresponding instructional events. Nine internal processes were cited as well as their accompanying instructional events. Table 3 relates these nine internal processes, their corresponding instructional events to this unit of instruction.

The primary media utilized within this instructional unit were Apple IIE Computers. Computers offer several advantages for producing audio-visual media (Anderson, 1983). The following list encompasses many of the most significant advantages of computer utilization that were explored by the designer throughout the development of this unit (Bialo and Sivin, 1989).

1. Computers can provide a multi-sensory approach to learning.

2. The computer can produce a variety of graphics which includes charts, graphs and pictures.

3. A computer can be programmed to be patient and non-judgmental.

4. The instructional sequence can easily be tailored to meet the needs of each student.

5. A computer affords the student the opportunity to succeed privately.

6. It allows for self-paced instruction.

7. The computer provides an alternative to traditional

Table 3

Internal Processes, Instructional Events and the Instructional Unit

Internal Process	Instructional Event	Instructional Unit
1. Reception	Gain Attention	Motivate through rapid stimulus change
2. Expectancy	Inform learner of the objectives	Tell the learner what they will be able to do
3. Retrieval to working memory	Stimulate recall of prior knowledge	Recall of executive subroutines and part-skills
4. Selective Perception	Present the stimulus	Demonstrate procedure and part skills
5. Semantic Encoding	Provide learning guidance	Practice, direct and continued
6. Responding	Elicit performance	Exhibit learned performance
7. Reinforcement	Provide feedback	Give informative feedback
8. Retrieval and Reinforcement	Assess performance	Require additional learner performance, with feedback
9. Retrieval and Generalization	Enhance retention and transfer	Practice and spaced reviews

instructional approaches.

8. Motivation for learning is enhanced through computer utilization.

9. When used for word processing, the computer motivates the

learner to stimulate and increase writing skills. Ease of editing procedures is a major factor in the increased motivation.

Computer utilization also presented some relevant disadvantages which were considered by the designer throughout the developmental process. Some of these disadvantages are listed in the ensuing section (Anderson, 1983).

1. The rapid obsolescence of expensive hardware and software presents a multitude of problems. This obsolescence lends itself to the high probability that equipment purchased today will be obsolete by next year or sometimes even sooner.

2. Quality computer systems are expensive.

3. Complications of a mechanical nature are prevalent and may occur at any time during instruction.

4. Equipment can be damaged through improper use.

Each learning activity within the instructional unit was designed to utilize a specific instructional method and its accompanying media. Table 4 relates each learning activity, the content of the activity, the instructional method used and media to this instructional unit.

Assessment System Specification

A variety of methods were utilized to evaluate the effectiveness of the learning activities. An entry behaviors test and a thorough checklist were deemed as essential tools to assess learning levels.

Entry Behaviors Test

A brief hands on entry behaviors test is administered utilizing the word processing program Bank Street Writer III. The test

Table 4

Learning Activity Instructional Strategy Matrix

Learning Activity	Content	Instructional Method	Media
2.0	Create Contraption	Demonstration Programmed Instruction	Computer Programmed Instruction Television Monitor Printed Materials
3.0	Write a Transportation Tale	Lecture Brainstorming Demonstration Programmed Instruction	Chalkboard Computer Programmed Instruction Television Monitor
4.0	Evaluate the Transportation Tale	Demonstration Oral questioning techniques Individualized interaction	Computer Programmed Instruction
5.0	Edit the Transportation Tale	Individualized interaction	Computer Programmed Instruction

includes the immediate use of the main menu as well as basic editing procedures. It also includes the complete procedure necessary for the successful loading and exiting of a software program. The student is asked to load the program, instructed to utilize various sections of the main menu and subsequently quit the program. A checklist is utilized to ascertain the competence of the student throughout the entry behavior test. If any student does not have the necessary prerequisites, then a lesson covering these subskills must be inserted as the primary lesson.

Checklist

To enable accurate testing evaluation of all of the students participating in the project, a checklist was deemed essential. The checklist includes loading the program, all steps necessary for the completion of the Contraption as well as the Transportation Tale, complete evaluation and editing of the Tale and the final exiting of the program. The checklist is utilized throughout the entire duration of the instructional unit by both the learner and the instructor. Directions for the learner and the instructor checklist vary slightly but have the same content. Both of these checklists may be found in Appendixes C and D, respectively.

At the completion of the instructional unit the checklist is once again reviewed by both the instructor and the learner. All checklists are then collated to determine the completion levels of the entire group of students. Only after examining the checklists can one determine the success of completion of the instructional unit.

Evaluation System Specification

Evaluation consisted of assessment on both the formative and summative levels. The following section deals with these evaluation methods.

Formative Evaluation

Formative evaluation deals with the collection of data and information during the development of instruction which may be used to improve the effectiveness of the instruction (Dick and Carey, 1985). Dick and Carey (1985) also described three basic phases of formative evaluation which includes one-on-one, small-group and

field trial evaluation. Five students participated in the one-on-one evaluation for this unit of instruction. Data was ascertained through the utilization of an attitude questionnaire as well as through previously mentioned checklists. The attitude questionnaire may be found in Appendix E. Upon analysis of each questionnaire and checklist as well as via verbal communication with the participants many viable changes were undertaken to enhance the unit of instruction.

The second phase of formative evaluation involved the selection of two randomly chosen small group trials. Each group consisted of five fourth grade students. This random selection was the preferred method of student choice in that it served to protect the validity of the evaluation. Data was collected via an attitude questionnaire, checklists as well as through verbal communication. All relevant information was recorded and organized on charts which may be found throughout the body of this report. Upon the successful completion of the two small group trials, a field trial was conducted.

The field trial consisted of twelve fourth grade students. Varied academic levels were represented within this group which enabled the designer to make relevant comparisons between the levels. Once again, data was collected via an attitude questionnaire, checklists and verbal communication. All compiled data was then recorded on a variety of charts which can be found within this text. At this time, the unit of instruction was deemed to be successful as reflected through the aforementioned data and further evaluation was continued on the summative level.

Data collected from the aforementioned one-on-one, small group and field trial evaluation included each of the following (Dick and Carey, 1985):

1. Test data from entry behaviors test and checklists.

2. Verbal communication in the form of comments or notations made by the learners about any difficulties encountered at particular points within the unit of instruction.

3. Data collected on attitude questionnaires.

4. The time necessary for successful completion of the unit.

Summative Evaluation

The summative level of evaluation consisted of accurate assessment on four separate levels: reaction, learning, behavior and results (Kirkpatrick, 1987). Reaction reflected the student attitudes toward the series of lessons. Data was collected through the utilization of an attitude questionnaire in which assessment was completed on each of the following levels: motivation, objectives, entry behaviors, tests, and instruction. Analysis was completed for this level and the favorable results were recorded within the evaluation chapter.

The level of evaluation entitled learning was concerned with the exact measurement of what the students understood and absorbed through instruction. The measurement of skills and techniques were of utmost importance within this section. A checklist was utilized to ascertain student performance as well as to provide valuable feedback throughout the series of lessons. Data ascertained from this section was compiled through a Checklist Analysis Chart.

At the third level of evaluation, behavior, the designer

determined whether the unit of instruction had any relevant effect on the students behavior. Once again a checklist was utilized by the instructor to determine whether the students were able to apply their newly acquired skills and techniques in the creation of other graphics without the utilization of a checklist.

The fourth level is entitled results. It dealt with the effect of the instruction on the group or in this case the class or entire school. A portion of this evaluation was evidenced immediately upon completion of instruction. However, a checklist may be utilized at a predetermined time in the future to ascertain the students application of these newly acquired skills and techniques as well as their prolonged effect on the group, class or school.

Learning Transfer System Specification

Students participating in this instructional unit were chosen from several classes. Therefore, the designer only had opportunity to observe these participants at certain time intervals. This does pose a variety of obstacles in the assessment of learning transference. However, with a cooperative effort between the classroom teacher and the designer many of these obstacles can be overcome.

Consistent with the design of this instructional unit, a checklist would be the most accurate way to determine whether the learners apply the new skills and techniques within the classroom environment. This checklist would be utilized by both the classroom teacher and the designer at various intervals. Comparisons between participants and non-participants would prove interesting and would offer a more viable picture of the effect of

the unit on the group.

Review and Selection of Existing Materials

Despite an extensive search for appropriate instructional materials, none were deemed to be applicable to this unit of instruction. Therefore, this unit was constructed without the application of any existing materials.

Summary

This chapter dealt with the actual design of this instructional unit. The relevance of clear planning and organization was evident. Initially, an instructional task analysis was completed in which six main tasks were identified. Sub-tasks for these six main tasks were then generated. Instructional objectives were then written to accompany each of these tasks and sub-tasks. At this point, a clear indication of the entry behaviors necessary for the successful commencement of this unit could be easily identified. It was also easy to organize the objectives into groups and relevant sequences. Once organized into these groups, learning activities were specified according to content, instructional method and applicable media. These same learning activities were then related to Gagne's (1985) nine steps of instruction.

Assessment and evaluation through the utilization of checklists, attitude questionnaires, and verbal information presented relevant information for the design of a successful instructional unit. Evaluation was also reviewed on the formative and summative levels. Learning transfer was discussed briefly as well as materials selected for inclusion in the instructional unit.

CHAPTER 4

DEVELOPMENT

Introduction

During the development stage, the designer must specify clearly and accurately any applicable learning activities inherent within the design and development of the instructional package. This initial development is often broad in scope and must be directed toward a more exact unit of instruction. Once this scope has been narrowed, learning activities can then be developed with a greater degree of accuracy.

The designer must also perform a review of the learning materials to ensure accuracy of content, clarity of directions, appropriateness of grammar and style, accuracy of punctuation and appropriate organization of the unit of instruction. After the review is completed, the materials for evaluation may then be produced.

Learning Activity Development Scheme

Initially this unit addressed a wide scope of computer utilization within the guidelines of curriculum. However, it became necessary to direct this computer utilization in a more specific way. Hence, the initial development of this unit of instruction. Once this scope was further narrowed, it enabled the designer to conceive a clear picture of the further development of the unit.

The first developmental decision that had to be made dealt with the utilization of a specific piece of software. After a complete

review of all applicable software, Transportation Transformation was chosen as the program most likely to achieve the desired results. Transportation Transformation was chosen in that it was an exceptional graphic writing program that was presented by the Learning Lab through Pelican Software Inc. It also included a double sided disk that was packed with hundreds of colorful graphics and a built-in text processor, five unique printing sizes, a color printing option as well as compatibility with a wide variety of printers. Transportation Transformation was also designed to foster creative writing in an extremely motivating manner. Thousands of vehicles and scenes utilizing hundreds of whimsical and life-like graphics were deemed easy to create and the full text screen processor enabled learners of a variety of ages to write Transportation Tales which were simply stories to accompany their creations. Also considered within this unit of instruction was the inherent ability of the program Transportation Transformation to meet the needs of learners at any academic level. The program allowed naturally for enrichment as well as for remediation. Thus, the designer decided to utilize this program throughout instruction.

Developmental decisions then addressed the proper sequence of instruction and presentation of learning materials. The utilization of the program, writing techniques, and applicable computer skills were all considered throughout the development of this unit.

Additional feedback was provided by a panel of professionals which included two administrators, a computer supervisor as well as

several classroom teachers. Each professional was offered the opportunity to view the software being utilized to ensure the success of the instructional package. At this point, a positive response was offered toward the initial choice of program. This served to reinforce the designer's selection of software and offered the designer some relevant suggestions for further instruction. At this point, suggestions were made as to the presentation of writing process steps in which a practice example was offered. This seemed to be a relevant suggestion and was incorporated within the unit of instruction. Further development was necessary that incorporated the aforementioned suggestion as well as a logical sequence of instruction centered around the graphic writing program Transportation Transformation.

Learning Activity Development

As previously mentioned, this instructional unit followed Gagne's (1985) nine instructional events. Each of these events were related directly to specific learning activities. These learning activities as well as their accompanying instructional events enabled the designer to integrate the aforementioned into a well designed unit of instruction. The following section describes the instructional unit as it relates to these instructional events.

1. Gain attention

The students were initially motivated upon entering the computer lab in that a single, enlarged Contraption was displayed and available for immediate observation. A television monitor was also connected mechanically to one of the computers in which a display of the same Contraption was available for examination.

Upon commencement of the instructional unit, the program was once again loaded into the computer and onto the television screen. At this point, the students were motivated by sight and sound through the utilization of vivid color and intonation. A contraption was assembled in the first few moments of the program further motivating students.

2. Inform learners of objectives

A specific list stating exactly what the student was responsible for completing was written on the blackboard. Printed copies were also available for each student to utilize and were checked off upon completion of each level. The aforementioned responsibilities included the following: loading the program, creating a Contraption, writing a Transportation Tale, editing the Tale, and exiting the program.

3. Stimulate recall of prior knowledge

Throughout the demonstration of the program Transportation Transformation, students were asked to recall a variety of executive sub-routines or part-skills necessary for the successful application of the present program. The function and location of specified keys on the keyboard, the description of the main menu and its functions as well as a variety of basic computers skills and techniques were prerequisite skills necessary for the successful completion of this unit of instruction.

4. Present the stimulus

Students were instructed orally as to the proper procedure for choosing the background, body, wheels and driver for the Contraption. This oral instruction involved the demonstration of

the software itself as well as the utilization of the main menu. The proper procedure for the creation of a Transportation Tale was also demonstrated.

5. Provide learning guidance

The writing portion of this unit was introduced initially through brainstorming. Students actively participated in the creation of a short story designed to stimulate the students to write well-written Transportation Tales. The students chose a topic, stated two main topics, wrote complete sentences as well as supporting details and created a first draft for a story. This practice activity enabled the student to write a well-written Transportation Tale.

6. Elicit performance

Application of the aforementioned instruction was given through the actual utilization of the program Transportation Transformation through the creation of a Contraption and its accompanying Transportation Tale.

7. Provide feedback

Informative feedback was offered throughout this instructional unit. Feedback was given in the form of printed copies of the student's work at various intervals, through the utilization of performance checklists that were utilized by both the student and the instructor as well as through individual interaction and verbal communication.

8. Assess performance

Student accomplishment was measured through the utilization of a checklist designed to inform the learner and instructor of the

desired outcomes. At the completion of this unit, completed contraptions and their accompanying transportation tales were displayed in the computer lab as well as throughout the entire school. Positive feedback as well as beneficial recognition of project completion provided the learner with a feeling of accomplishment.

9. Enhance retention and transfer

Checklists utilized by the instructor and the learner were reviewed to cite any inconsistencies. Students were encouraged to utilize a variety of graphic writing programs similar to Transportation Transformation to further enhance the retention and transfer of the techniques and skills evident within this instructional unit.

Entry Behaviors Test

In order to ensure the success of the unit, an entry behaviors test must be given to assess the prerequisite skills of all learners. This test can be administered utilizing the word processing program Bank Street Writer III loaded into an Apple IIE Computer. The test must include the immediate utilization of the main menu as well as basic editing procedures. It must also include the complete procedures necessary for the successful loading and exiting of a software program. The student must be asked to load the program, be instructed to utilize various sections of the main menu and subsequently quit the program. Instructions must be written on a handout which must have an explicit list of directions with which to follow. A checklist is utilized to ascertain the competence of each student throughout the

entry behaviors test. Each student must then print out a copy of the completed entry behavior test. It must also be noted here that the aforementioned entry behaviors test was not utilized within this instructional unit in that all entry behaviors were known to the instructor. However, one must be administered when entry behaviors need to be assessed.

Transportation Transformation

Having previously chosen the aforementioned software for this instructional unit, the designer then began to focus development upon the application of this program. This application was divided into five separate sections and are described in the following sections.

1. **Create a Contraption**

An Apple IIE Computer, monitor, disk drive and Panasonic Printer was utilized with the software program Transportation Transformation. One computer which was connected mechanically to a television monitor is utilized for demonstration. The monitor displayed one example of a completed Contraption. (See Appendix F for two sample contraptions.) A large pre-printed Contraption was also on display in the front of the classroom. Students were then instructed orally as to the proper procedure for choosing the background, body, wheels, and driver. This oral instruction also involved some demonstration of the software itself as well as the utilization of the main menu. Upon completion of a Contraption, the students printed out their transportation vehicle. A checklist was also utilized to ascertain student progress. The aforementioned checklist can be found in Appendix C.

2. **Write a Transportation Tale**

As a class, the students were encouraged to write their own practice story prior to the actual completion of their Transportation Tale. The students were directed to choose a topic through brainstorming techniques, state two main ideas about the topic, write complete sentences as well as supporting details and create a first draft of a story. This short story was completed briefly upon the onset of class through the utilization of a Story Chart so that the students were aware of the proper procedure for creating a Transportation Tale. (See Appendix G.) At this point, the students were ready to write their first drafts of a Transportation Tale. The students saved as well as printed out a copy of this first draft. A checklist was utilized to determine student progress.

3. **Evaluate and Edit the Transportation Tale**

The children were instructed to retrieve their first draft from their data disk. Individually each student was then asked to proof-read their tale and immediately begin to make any necessary changes. These changes involved the utilization of basic editing procedures including inserting and deleting. Upon completion of the Transportation Tale, the students printed out a finished copy of the Tale. A checklist was utilized to ascertain student progress.

4. **Remediation**

One of the noteworthy characteristics of utilizing the computer was the ease at which each student was afforded the opportunity to work at their own levels of ability. The software

program utilized here was a prime example of this. If a student demonstrated any trouble with the program, a self help section was brought up on the screen immediately thus enabling the student to proceed with the program. It must also be noted here that a student did not have to utilize all the components of this computer program in order to successfully compete the instructional unit. A Contraption created utilizing only one body, wheels, and a driver with an accompanying short transportation tale was assessed the same as one utilizing more body shop parts and a longer tale. The important factor here in the development of this unit of instruction was that each student was afforded the opportunity to work up to their potential and this program allows the student to do this readily. So, technically many remediation factors were already included within the scope of the software program itself.

4. **Enrichment**

The student who demonstrated a need for enrichment may choose to create a more involved contraption utilizing not only the very basic body shop parts but many additional parts as well. This particular type of student was encouraged to create a more complex transportation tale. If the student completed the aforementioned instructional unit with the appropriate level of competence, a larger print out of the contraption may be desired in which the student was able to design with color a poster size picture that may be used for display.

Thus, a unit of instruction was developed that involved the utilization of a graphic writing program, Transportation Transformation, to motivate students to write as well as to increase their writing skills.

Learning Activity Review

A complete review of all essential materials at this stage of development was undertaken in order to ensure the development of a successful unit of instruction. The instructional package was reviewed for accuracy of content, appropriate sequence of instruction, clarity of directions, accuracy of checklists, correct spelling, and suitable format. Appropriate grammar and style as well as accurate punctuation were also of major concern at the time of the review. Several professional persons including two supervisors, a classroom teacher and a computer supervisor reviewed the materials and found them to be in acceptable order and of accurate design. The logical sequence of instruction coupled with the clarity of directions, and accuracy of checklists were cited by these professionals as acceptable to the design and development of this project.

Materials for Evaluation Produced

All materials necessary for the completion of this unit of instruction were accurately produced. Of utmost importance was the production of the performance checklist which was designed to assess student performance. One copy was made for each student and was to be utilized throughout the unit as well as throughout the one-on-one, small group trials and field trial at the formative level of evaluation. An attitude questionnaire was also produced to ascertain relevant information on a variety of levels during the summative evaluation.

Summary

The learning activities encompassed within this chapter reflect a directed approach to the development of this unit of instruction. Learning activities that sequentially followed the nine instructional events were specified and developed. The instructional package involved the utilization of the graphic writing program Transportation Transformation. The utilization of this program was organized into a variety of developmental sections that included the creation of a contraption, the writing of a transportation tale, proof-reading and editing the tale as well as sections designated for remediation and enrichment. Once these learning activities were developed, a thorough review of them by a group of professionals was undertaken. These professionals reviewed the package for clarity of directions, accuracy of content, punctuation, style, grammar, accuracy of checklists, appropriate sequence of instruction and suitable format. Upon completion of the review, all applicable materials for evaluation were produced.

CHAPTER 5

IMPLEMENTATION

Introduction

The implementation of this project dealt directly with the utilization of Apple IIE Computers within an elementary classroom setting. A graphic writing program entitled Transportation Transformation was utilized in which each student was instructed to create a contraption (transportation vehicle) as well as a transportation tale. The contraptions were created through the student's use of various menus thus enabling them to piece together their own unique contraption.

The creation of a document which included preparation from an original main idea, supporting statements, proof-reading, editing as well as final revision of the finished product was also incorporated. Characteristic of this program was its ability to adjust to the academic level of each student. One student may choose only the very basic selections with which to create a contraption and write a short but complete story. Enrichment was fostered through the creation of a more involved contraption requiring additional graphics as well as a more complex story. If the student completes the instructional unit with the appropriate level of competence, a larger print out of the contraption may be desired in which the student can design with color a poster size picture that may be used for display.

Finally, a specific checklist was utilized to determine student performance. The students received a copy of this checklist so

that each may be able to assess their own progress. Upon completion of this checklist, the student completed the instructional unit successfully.

Materials for Implementation Reproduced

Throughout this instructional unit, each student utilized an Apple IIE Computer, monitor, disk drive, and Panasonic Printer accompanied with the software program Transportation Transformation. Even though this was not mentioned at each lesson level, it was understood that these instructional materials were utilized throughout the instructional unit.

Transportation Transformation is a graphic writing program presented by Learning Lab through PELICAN Software Inc. Transportation Transformation includes a double sided disk packed with hundreds of colorful graphics and a built-in text processor, five unique printing sizes, a color printing option as well as compatibility with a variety of printers and interface cards. The program fosters creative writing in an extremely motivating yet beneficial way. Thousands of vehicles and scenes using hundreds of whimsical and life-like graphics can be easily created. Using the full screen text processor, learners of all ages can write transportation tales to accompany their creations.

All instructional materials utilized within this instructional unit can be referenced in Appendixes F and G. Samples of the various print sizes can be found in Appendix H. These sample print sizes which include standard, small, large, tall and short have been printed utilizing the same student generated contraption and tale to ensure a clear representation of each size.

Lesson One

A brief hands on entry behavior test must be administered utilizing the word processing program Bank Street Writer III loaded into an Apple IIE Computer. The test must include the immediate use of the main menu as well as basic editing procedures. It must also include the complete procedures necessary for successful loading and exiting of a software program. The student is then directed to load the program, instructed to utilize various sections of the main menu and subsequently quit the program. Instructions are to be written on a handout which will have an explicit list of directions with which to follow. A checklist is utilized to ascertain the competence of each student throughout the entry behaviors test. Each student is also directed to print out a copy of the completed entry behavior test. It must also be noted here that the entry behaviors test was omitted from this unit of instruction in that the instructor was already cognizant of the learners' prerequisite skills. However, should this unit be applied further by other instructors and designers, an entry behaviors test would be essential.

Lesson Two

This lesson involved primary exposure to the program Transportation Transformation. Initially, a large pre-printed contraption was on display in the front of the room. Upon completion of the creation of a contraption, the students printed out their respective contraptions. A checklist was utilized to ascertain student progress.

Lesson Three

A chart was utilized to demonstrate the proper sequence with which to begin a solid basis for a well-written story. It included a topic, two main ideas, complete sentences as well as supporting details that lead directly to the creation of a first draft of a story. The chart gave a clear outline as to what should be included in the story and is included in Appendix G. This procedure was then applied to the instructional situation through the program Transportation Transformation. The students saved and printed out a copy of their first draft of their tale. A checklist was utilized to determine student progress.

Lesson Four

The students utilized the program Transportation Transformation to retrieve their first draft from their data disk. Individually each student proof-read their tale and began to make any necessary changes. These changes involved the utilization of basic editing procedures including inserting and deleting. Upon completion of the transportation tale, the students printed out a finished copy of the tale. A checklist was utilized to ascertain student progress.

Lesson Five

Once again, the students utilized to program Transportation Transformation to complete work on their projects. At this point, the program allowed for enrichment through the students opportunity to print out a large contraption to accompany their stories. Those students who required more time to complete their projects used this time to do so. All students printed out their completed

transportation tales and mounted them with their contraptions on construction paper for display. A checklist was utilized to ascertain student progress.

At this time, any applicable instructional materials were reproduced and were to be utilized throughout the implementation phase of design.

Instructional Delivery

The process of delivering instruction for the implementation phase and the evaluation phase transpired in the computer lab at Birch Lane Elementary School, Massapequa, New York. Completion of all one-on-one, small group, and field trials encompassed approximately two weeks time. The following section describes the instructional delivery categorized by lesson.

Lesson One

The content of lesson one was described previously in the materials section. Therefore, it was not necessary to give the hands on entry behaviors test to the learners for this instructional unit. This was only true for this group in that they have been participating in regular computer classes since the beginning of the school year. In effect, they already have been given an entry behaviors test simply by attending, participating and applying the knowledge gained throughout their computer classes.

Lesson Two

As the students entered the classroom, they were able to observe an enlarged print-out of a contraption. One computer utilized for demonstration was connected to a television monitor.

This displayed one example of a completed contraption. Thus, the class began with enthusiasm and motivation. Students were then instructed orally as to the name of the software being utilized as well as in the proper procedure for choosing a background, body, wheels, and driver. This oral instruction involved some demonstration of the software itself as well as the utilization of the main menu. The students then followed the proper procedure and created a contraption. A checklist was utilized to ascertain student progress. Students as well as the instructor obtained copies of the checklist so that each were able to assess progress continually and realistically. This lesson encompassed approximately forty minutes of instructional time.

Lesson Three

The instructor coupled with vital student participation created a chart designed to aid in the creation of a well-written story. Through brainstorming, the students selected a relevant yet current topic with which to demonstrate the proper organizational techniques vital to the creation of a well-written selection. This topic was written at the top of the blackboard. (A large sheet of oaktag or similar paper will also do but does not allow for easy correction.) In triangular form, the topic being at the top, the students wrote two main ideas that were to be encompassed within the story at the bottom points. Below these main ideas complete sentences and supporting details were written. This chart enabled the learners to visualize a clear outline of what was necessary to commence writing a first draft of their story.

Utilizing the aforementioned procedures, the student wrote a

first draft of a transportation tale. The student saved and printed out a copy of their first draft of the tale. A checklist was utilized to determine student progress. This class utilized approximately forty minutes of class time.

Lesson Four

At the onset of class, each student loaded the program Transportation Transformation and retrieved their first drafts from their data disk. Individually, each student proof-read their tale and began to make any necessary changes thereby utilizing basic editing procedures. Teacher assistance in the form of valuable feedback was necessary in order to facilitate the creation of a well-written transportation tale. Encouragement was offered as well as a review of the checklist stating the requirements for each lesson. Upon final completion of the transportation tale, each student will print out a finished copy of the tale. Any student unable to complete the tale within the confines of the class time allotted was offered the opportunity to complete the activity next class. A checklist was utilized to ascertain student progress. Approximately forty minutes of instructional time was allotted for this lesson.

Lesson 5

This lesson was designed to allow for enrichment or remediation. Those students requiring additional time were able to utilize this time for completion of their tales. However, it must be stressed here that one of the major characteristics of this program was that each student was given the opportunity to proceed at his or her own speed. All students were able to choose the very

basic selections with which to create a contraption and write a short complete story. The student who demonstrated a need for enrichment was able to choose to create a more involved contraption requiring additional body shop parts as well as a more complex story. Upon completion of the aforementioned instructional unit with the appropriate level of competence, a larger print out of the contraption may be desired in which the student was afforded the opportunity to design with color a poster size picture that was utilized for display. Each student's work was mounted on construction paper for display. Once again, a checklist was utilized to ascertain student progress. This final lesson encompassed forty minutes of instructional time.

Data Collection

Data collections for the formative evaluation was based primarily upon the utilization of an attitude questionnaire. The questionnaire, which was utilized at the conclusion of each one-on-one and small group evaluation, was sub-divided into six separate categories of evaluation. The categories were as follows: motivation, objectives, entry behaviors, tests, instruction and general. These categories enabled the designer to accurately assess the success or failure of the instruction at critical levels. It also enabled the designer to clearly observe at which level improvement was essential. Throughout the one-on-one evaluation this questionnaire was utilized in interview form. Small group evaluation utilized the questionnaire at the completion of the instruction as a simple assessment survey. The sub-divisions inherent in the design of the attitude questionnaire were

created so that evaluation could be ascertained on various pertinent levels crucial to the development of a successful unit of instruction. Motivation was the first area of concern addressed within the questionnaire. This area was crucial in that without the proper motivation a seemingly sound instructional unit may experience failure. Questions in this section reflected the students level of motivation as assessed through various media and methods. It also reflected the learners' views on the utilization of such materials and methods as well as their participation in this program. The next level, entitled objectives, was utilized to ascertain whether the students understood what was expected of them. Each student was instructed to create a contraption, write a transportation tale as well as to utilize the steps necessary for the creation of a well-written story. All questions utilized in the objective section reflected this instruction. The next section, entitled entry behaviors, evaluated exactly what the students were expected to know to the onset of instruction. It also clearly exemplified whether a learner exhibited all the necessary entry behavior requirements. The fourth section entitled tests was designed to evaluate the utilization of the checklist. Questions were designed to ascertain the clarity of the checklist as well as the degree of difficulty. The next level of assessment dealt with the evaluation of the actual instruction. Many relevant questions were utilized encompassing all information from basic directions to the actual creation of the contraptions and tales. The final section was designed to assess the entire project in general. It also allowed for valuable learner input and feedback.

The aforementioned attitude questionnaire was utilized on the field group evaluation accompanied by two performance checklists. One checklist was designed for the utilization of the instructor and the other for student feedback. The checklist was divided into six separate sections. Each section had several sub-sections which were to be completed before each major section was checked as completed. This was explained in further detail in the directions on the checklist for successful student use. The first section evaluated the student's ability to successfully load the software program. The second section clearly stated the exact specifications for the successful creation of a contraption. Next, a section for ascertaining as to whether the student accurately followed the proper steps for creating a well-written transportation tale. The evaluation and editing of this tale was assessed in sections four and five. Exiting the program was assessed in section six. At the completion of this unit not only was an evaluation of the program on all previously mentioned levels completed but a comparison of student and teacher responses was conducted. The results were placed on a chart that was placed in the appendix. Statistics were also utilized to reinforce the positive or negative aspects of this instructional unit as a whole.

Further data collection involved utilization of feedback from other professionals. Suggestions through observation and one-on-one contact was evaluated and taken into full consideration. This integration of evaluation enabled the designer to produce a successful unit of instruction.

Summary

The implementation chapter was carefully designed so that each section was presented as clearly as possible. It was separated into three sections encompassing instructional materials, instructional delivery and data collection. Instructional materials described all the specific materials necessary for successful application of this unit. Samples of these were also included.

Instructional delivery described the exact procedure necessary for successful completion of the instructional unit. It also stated specifically where the various materials were utilized within this unit.

Data collection was based primarily on the utilization of an attitude questionnaire. This attitude questionnaire was sub-divided into six separate levels of evaluation. The categories were as follows: motivation, objectives, entry behaviors, tests, instruction and general. These categories enabled the designer to accurately assess the success or failure of the instruction at various critical levels. Two checklists were also utilized to ascertain student performance. One was utilized by the student, the other by the instructor. Further data was collected through feedback from other professionals and direct observations.

The successful integration of these evaluation techniques enabled the designer to produce a successful unit of instruction.

CHAPTER 6

EVALUATION

Introduction

Evaluation consists of assessment on both the formative and summative levels. The formative evaluation is divided into three separate phases. The three phases are one-on-one trials, small group trials and field trials. Five one-on-one trials were completed as well as two randomly chosen small group trials. One final field trial was completed consisting of twelve participants. Through the utilization of an attitude questionnaire as well as two separate checklists, accurate evaluations were concluded and a successful unit of instruction was constructed. The attitude questionnaire consisted of six separate levels of evaluation: motivations, objectives, entry behaviors, tests, instruction and general information. The checklist evaluated the learner at each of six different levels of instruction. Each level must be completed before proceeding to the next level. The six levels are as follows: load the program, create a contraption, write a transportation tale, evaluate the tale, edit the tale and successfully exit the program.

The summative evaluation consists of accurate assessment on four separate levels. These four levels are those as described by Kirkpatrick and are as follows: reaction, learning, behavior, and results. All of these levels are evaluated thoroughly and provide accurate data to support the further utilization of this instructional unit on a broader scale.

Learning transfer must also be specified in order to ensure the application of the instructional unit to a variety of learning situations. This must be explored to enable the designer to evaluate the continued success of the instructional unit.

Formative Evaluation

The first of two essential forms of evaluation is that of formative evaluation. Formative evaluation is the collection of data and information during the development of instruction which can be used to improve the effectiveness of the instruction. The data obtained during this process is utilized in the revision of instruction to make it more efficient and effective (Dick and Carey, 1985).

Formative evaluation consists of three basic phases as follows: one-on-one evaluation, small group evaluation, and field trial evaluation (Gagne, 1985). These three phases were utilized by the designer throughout the evaluation stage of this unit.

One-on-One Trials

One-on-one trials involve the participation of individuals in order that data may be obtained to aid in the revision of instructional materials. The following section relates all data ascertained during this phase of evaluation categorized by student.

Student One

The first subject utilized for the one-on-one evaluation was a male fourth grade student currently functioning at or above grade level with an I.Q. of 111. Student one was immediately excited and eager to proceed with his participation in the aforementioned series of lessons. This was reflected in the attitude

questionnaire. Thus the initial exposure to the project utilizing Transportation was successfully motivating. Objectives were reported as very clear and easy to understand. However, the steps necessary for the creation of a well-written story did pose a slight problem. While the chart utilized together to illustrate the proper steps necessary for a well-written story were clear, the application to the transportation tale were not as clear. The student had difficulty outlining the steps of the story on paper in that paper does not allow one the flexibility of revising written thoughts neatly and clearly. While the student did write a well-written story, the designer at this point began contemplating the revision of the application so that each step would be clearer to the student and would allow the student greater flexibility for change. Student one had no problem locating any specific keys on the keyboard and exhibited great ease in utilizing the main menu inherent in the program. Checklists were stated as clear and easy to follow. This student thoroughly enjoyed creating a contraption as well as its accompanying tale. In fact, the student requested an opportunity to utilize the program sometime in the near future.

Student Two

Student two was a female fourth grade student functioning at or above grade level with an I.Q. of 124. This student was also extremely eager to participate in the series of lessons. At this point, it appeared that the techniques utilized for motivational purposes were successful. Objectives were stated by the student to be clear. The chart utilized for the steps necessary for the creation of a well-written story was clear. This chart was written

on the blackboard, thus enabling the student greater flexibility for revision. However, when asked to apply these steps to the tale, problems arose in that the student was not able to utilize the blackboard but once again was confined to the utilization of lined paper. At this point, a definite change was needed for the application process to be a smooth less frustrating experience. Student two had no difficulty locating any necessary keys on the keyboard and had no problem whatsoever following the applicable checklists. Student two expressed a desire to utilize a similar program entitled Dinosaur Days which the student had observed in another classroom. The only improvement requested was that of additional time allotted to the creation of more contraptions.

Student Three

Student three was a fourth grade female currently functioning at or slightly below grade level with an I.Q. of 95. This student was also eager to participate and was overly motivated especially after having viewed a completed contraption. Student three stated that she clearly understood the objectives. A chart was once again utilized on the blackboard in order to demonstrate the proper steps necessary for the creation of a well-written story. However, this time the steps were applied to the tale through the utilization of three by five cards. This enabled the student the flexibility necessary for proper organization and correct sequencing of details. The cards were easily re-organized by simply readjusting their positions. They also allowed for a much smoother transition from the chart to the writing of the tale. Student three had no trouble locating any keys on the keyboard but exhibited slight

difficulty in the utilization of the main menu. This difficulty arose as a result of the student's inaccurate reading and following of directions but was not a product of the applicable software. Student three also stated that the checklist was clear and easy to follow. She also stated that she thoroughly enjoyed the series of lessons and expressed a desire to do more.

Student Four

Student four was a male fourth grade student functioning at grade level with an I.Q. of 102. This student was also adequately motivated for participation in this series of lessons. He seemed overly enthusiastic when he viewed the contraption in color on the large television monitor. In fact, his contraption utilized many more graphics from the body shop menu than were required for successful completion of this project. His story was equally as creative and well-written. Student four stated that he understood what was expected of him and verbally listed the objectives exactly as instructed. He also utilized the three by five cards successfully in the smooth application of the steps for creating a well-written story from the chart to the tale. He stated that the checklist was simple to follow and exhibited no problem in the location of specific keys. The remainder of the lessons were accomplished without any complications. This student suggested that the only improvement that he would make would be to forget the three by five cards and get right to the tale.

Student Five

Student five was a female fourth grade student functioning at grade level with an I.Q. of 110. This student initially did not

want to participate in the series of lessons, especially after she realized that it would be more than one class. However, once exposed to Transportation Transformation, she was subsequently motivated to participate further. Student five designed an incredibly creative contraption and tale. More body shop parts than required were chosen by the student for the contraption and a more involved tale accompanied it. She also did not reflect any problems with the utilization of the cards for creating an organized, properly sequenced story. Objectives were stated by the student to be clear and easy to follow. The student did not have any complications locating any specified keys on the keyboard and stated that she was able to follow the checklist without any great difficulty. Student five suggested that in order to improve this group of lessons the designer would have to increase the number of them so that there would be less pressured time for creation of the contraption and tale.

The previously mentioned information was ascertained through the utilization of an attitude questionnaire as well as through previously mentioned and described checklists. A table which compiled this data is as follows.

At this point, it was decided that evaluation was to continue into the next phase dealing with two randomly chosen small group trials.

Small Group Trials

Two groups of five fourth grade students were randomly chosen to participate in the small group evaluation phase of this project. Random selection was the preferred method of student choice in that

Table 5

One-One-One Data Table

Subject	Gender	I.Q.	Contraption Completed	Tale Completed
Student One	Male	111	Yes	Yes
Student Two	Female	124	Yes	Yes
Student Three	Female	95	Yes	Yes
Student Four	Male	102	Yes	Yes
Student Five	Female	110	Yes	Yes

it served to protect the validity of the evaluation. Data ascertained during the small group trials are reported below.

Group One

This group consisted of three males and two females randomly chosen from five fourth grade classes. The students were of mixed academic abilities and reflected an average I.Q. of 104. Two of the students were functioning at or sightly below grade level. The remaining three students were functioning at their aforementioned grade level.

Upon entering the classroom, group one was immediately exposed to the program Transportation Transformation throughout the utilization of monitor images, large television images as well as an enlarged printed out copy of a contraption. This was exactly as

stated in the instructional delivery and appeared to have the desired resulting motivation and accompanying eagerness for participation. The aforementioned motivation and eagerness was reflected in the attitude questionnaire. Objectives were stated to be clear and relatively easy to follow. The sample story was motivating in that it dealt with an exciting assembly that the students were fortunate to experience which involved a three piece band that played a smattering of top hits. Three by five cards were once again utilized to organize thoughts and story sequence. This particular group of students wanted to omit the use of the cards altogether and felt sufficiently confident in the creation of a well-organized tale. However, the designer insisted upon their use but allowed the students to divide their cards according to what they intended to encompass within each paragraph. At this point, the designer did not insist upon complete sentences but did insist upon a complete listing of what was to be included in each paragraph. This seemed to work out well. The organization was the same but not as involved as previously intended.

Checklists which were completed throughout the series of lessons were stated as clear and easy to follow. No student demonstrated difficulty utilizing any keys on the keyboard nor in manipulating the various menus.

Two of the students completed the series of lessons a full class ahead of schedule. These students were then able to print out a large picture of their contraptions and color them appropriately. A slight printing problem arose at this time which has since been remedied. The software would not print with the

originally selected printer and printer set-up. Once the set-up was changed, the software enabled the computer to relay the appropriate signals to enable the printer to print the contraptions and tales. Other then mechanical difficulties inherent in increased computer use, the series of lessons was accomplished without any major subsequent problems.

The following table summarizes all data obtained from the first small group evaluation.

Table 6

Small Group Data Table

Group One

Subject	Gender	Academic Abilities	Contraption Completed	Tale Completed
Student One	Male	Average	Yes	Yes
Student Two	Male	Average	Yes	Yes
Student Three	Male	Below Average	Yes	Yes
Student Four	Female	Average	Yes	Yes
Student Five	Female	Below Average	Yes	Yes

Group Two

Group two consisted of four males and one female. Academic levels were varied in that two were functioning above grade level and the remaining three were at grade level. The average I.Q. of

this group was 112. Each student arrived at the computer lab at slightly different times. The two students that arrived a few minutes early were overly eager to begin utilizing Transportation Transformation. Their desire to begin immediately motivated them to inadvertently press a few prominent keys on the keyboard. This locked up the computer resulting in the re-loading of two of the computers. However, once this was completed, the series of lessons began smoothly. Each student was able to verbally state the objectives and had no problem utilizing the main menus as well as locating any specific keys on the keyboard. The sample story completed on the blackboard, dealt with curfews. This topic was incidently chosen by the students themselves. Three by five cards were utilized successfully in the creation of well-written stories. Problems were encountered when each student attempted to save his or her work. This was once again a mechanical problem. At this point, the designer chose to form a communication with the company that produced the aforementioned software to discuss these difficulties.

Data obtained through the second small group trial was compiled and organized on the Table 7. After completion of the aforementioned small group evaluations, the designer decided to conduct a field trial evaluation.

Pilot Test

The pilot test consisted of twelve fourth grade students in which six males and six females participated. Four of the students were below average, four at average and four above average. The varies academic levels were chosen intentionally to ensure the

Table 7

Small Group Data Table

Group Two

Subject	Gender	Academic Abilities	Contraption Completed	Tale Completed
Student One	Male	Above Average	Yes	Yes
Student Two	Male	Above Average	Yes	Yes
Student Three	Male	Average	Yes	Yes
Student Four	Male	Average	Yes	Yes
Student Five	Female	Average	Yes	Yes

success of the lessons on all levels. A compilation of this data can be found in Table 8.

The pilot test was successful and was completed smoothly. As previously stated, all of the students were exposed to Transportation Transformation as they entered the lab. The large television monitor was connected mechanically to one of the computers thus enabling a large display of a sample contraption. All twelve computers were loaded with Transportation Transformation and a large contraption was on display. Thus the lesson began with much enthusiasm, eagerness, and positive motivation. This statement reflected accurately the results as ascertained through the attitude questionnaire.

Table 8

Pilot Test Data Table

Subject	Gender	Academic Abilities	Contraption Completed	Tale Completed
Student One	Male	Above Average	Yes	Yes
Student Two	Male	Average	Yes	Yes
Student Three	Female	Below Average	Yes	Yes
Student Four	Male	Average	Yes	Yes
Student Five	Male	Below Average	Yes	Yes
Student Six	Female	Above Average	Yes	Yes
Student Seven	Male	Average	Yes	Yes
Student Eight	Male	Above Average	Yes	Yes
Student Nine	Female	Above Average	Yes	Yes
Student Ten	Female	Average	Yes	Yes
Student Eleven	Female	Below Average	Yes	Yes
Student Twelve	Female	Below Average	Yes	Yes

Most students also stated that the objectives were clear and were able to verbally state them. Once again, a sample story was

then utilized which in this lesson dealt with the Mets. This topic was once again chosen by the students. Three by five cards were utilized in which each card stated exactly what was to be encompassed within a particular paragraph. All of the students were still not receptive to the utilization of the cards. Some voiced a preference for utilizing them yet others immensely disliked them. Upon completion of this lesson, other professionals were consulted as to the continuance of the cards. Through much discussion, it was decided that the cards were an acceptable and beneficial activity.

All of the students in this sample had no trouble locating any keys on the keyboard and most had little or no trouble utilizing the menus. The students stated that the checklist was easy to follow. Completion of the contraption and the tale was accomplished within the time frames specified. Two students were able to print out large contraptions. Most students utilized a greater number of graphics than was specified for the successful completion of the project. Data supporting this can be found in Table 9. A slight mechanical problem also occurred when various students expressed the desire to print. However, it was soon remedied enabling all to print their work out.

This unit of instruction was deemed to be successful as reflected through the aforementioned attitude questionnaire and checklists. Further evaluation continued in the summative evaluation section.

Summative Evaluation

The summative level of evaluation consisted of accurate

Table 9

	Number of Graphics Completed			
Subject	1-3	4-6	7-9	10+
Student One		X		
Student Two			X	
Student Three				X
Student Four			X	
Student Five		X		
Student Six		X		
Student Seven			X	
Student Eight			X	
Student Nine			X	
Student Ten		X		
Student Eleven		X		
Student Twelve				X
Totals		5	5	2

assessment on four separate levels. These four levels were described by Kirkpatrick (1976) and are as follows: reaction, learning, behavior and results.

Reaction

The level entitled reaction was utilized as a major portion of this evaluation in that it directly reflected student attitudes toward the series of lessons. An attitude questionnaire designed specifically to ascertain relevant information on the following levels of assessment was utilized: motivation, objectives, entry behaviors, tests, and instruction. Motivation was designed and evaluated to ascertain the relevance of the utilization of various stimulating materials as well as the eagerness of student participation. Questions on this level assessed the utilization of the large television monitor, the viewing of the program

Transportation Transformation immediately upon arrival at the computer lab as well as immediate exposure to a completed contraption. Analysis was completed for this level of assessment and the results appear in Table 10. Statistics were calculated

Table 10

Motivation

Question Number	Response One	Response Two	Response Three
1	11	1	0
2	10	2	0
3	10	2	0
4	9	2	1
Totals	40	7	1
Percentages	83.33%	14.58%	2.08%

providing valid information as it pertained to the level of motivation. Percentages were calculated for this level as well as all other applicable levels. Response one was the favored response in that the questionnaire followed a Likert questionnaire form in which the first response was the positive response and the last the most negative response. A median response was included at the center of the negative-positive spectrum. Thus, as reflected directly through statistical manipulation, the percentage of all participants that responded favorably to the motivational techniques utilized at the onset of this lesson was 83.33%. Those that fell toward the center of the spectrum represented 14.58% of the participants. A mere 2.08% was calculated at the lower portion of the responses.

The next area designed within the questionnaire was that of

objectives. These questions dealt with the clarity of the objectives as well as the steps necessary for the successful completion of them. Sixty-one percent of the participants responded positively to these questions while 33% fell at the

Table 11

Objectives

Question Number	Response One	Response Two	Response Three
1	12	0	0
2	8	4	0
3	2	8	2
Totals	22	12	2
Percentages	61.11%	33.33%	5.56%

center of the scale. A small percentage, 5.56% responded negatively. Data ascertained at this level was recorded on Table 11. Thus, it was statistically assessed that the objectives were clear and the steps necessary for completion of the project were also.

The attitude questionnaire also evaluated entry behaviors. Questions were designed to assess the students knowledge of the processes of loading and quitting a program as well as the utilization of various keys and the main menus. Once again the most favorable response was first, the least desirable last with an intermediate value between them. After statistical calculations, it was concluded that 62.5% of the participants stated that they were confident with their prior knowledge and with the application of this knowledge to a new learning experience. Twenty-nine

percent of the participants fell into the intermediate level for evaluation, while 8.33% offered unfavorable responses. Data to support the aforementioned statistics was recorded clearly on Table 12.

Table 12

Entry Behaviors

Question Number	Response One	Response Two	Response Three
1	12	0	0
2	8	3	1
3	9	3	0
4	1	8	3
Totals	30	14	4
Percentages	62.5%	29.17%	8.33%

A section designed to determine the clarity of all applicable checklists was essential. The questions here were designed to determine the degree of clarity of the student checklist as well as ease of following directions. Table 13 reports all data obtained from this specific area of evaluation.

Table 13

Checklist

Question Number	Response One	Response Two	Response Three
1	9	3	0
2	9	3	0
Totals	18	6	0
Percentages	75%	25%	0%

The next level of evaluation was designed to assess the

instruction. Questions were designed to assess student enjoyment, clarity of directions, helpfulness of the sample story and the outline cards as well as their interest in individual story creation. Sixty-two percent of the participants chose the most favorable response thus enabling the designer to determine that instruction was successful, clear, and motivating. Twenty-nine percent fell towards the center of the scale while only 8.33% fell below. Table 14 reflects all pertinent data from this level of evaluation.

Table 14

Instruction

Question Number	Response One	Response Two	Response Three
1	12	0	0
2	10	2	0
3	6	5	1
4	8	3	1
5	4	6	2
6	4	6	2
7	10	2	0
8	6	4	2
Totals	60	28	8
Percentages	62.5%	29.17%	8.33%

The last level encompassed on the attitude questionnaire was that of a general nature. The corresponding questions were general and were designed to assess the over all view of the lessons. Statistically, 62.5% of the participants responded with the favored response. Twenty percent fell towards the intermediate response with only 16% responding with a negative response. Based on these statistics, the designer was able to conclude that the unit at this level of evaluation was successful. See Table 15.

Table 15

General

Question Number	Response One	Response Two	Response Three
1	12	0	0
2	3	5	4
Totals	15	5	4
Percentages	62.5%	20.83%	16.67%

Statistics were also calculated for the attitude questionnaire in its entirety. This gave the designer an enlarged picture of the results. Almost 68% of the participants responded with the most favorable response. Twenty-six percent responded with an intermediate response while only 6% responded unfavorably. Table 15 reflects the compilation of all the data ascertained throughout the attitude questionnaire.

Table 15

Pilot Test
Attitude Questionnaire Analysis

Area of Concentration	Positive Response One	Neutral Response Two	Negative Response Three
Motivation	40	7	1
Objectives	22	12	2
Entry Behaviors	30	14	4
Checklist	18	6	0
Instruction	60	28	8
General	15	5	4
Totals	185	72	19
Percentages	67.03%	26.09%	6.88%

Overall, in the evaluation level of reaction, it can be stated and statistically proven that the learners assessed the lessons as

valuable, clear, motivating, and enjoyable.

Learning

The level of evaluation entitled learning was concerned with the direct evaluation of what the students understood and absorbed through instruction. It was primarily concerned with the exact measurement of skills and techniques that were presented within the framework of the series of lessons. Through utilization of a checklist, the instructor was able to accurately assess student performance. The checklist also enabled the students to receive valuable feedback throughout the series of lessons. All students were familiarized with the program entitled Transportation Transformation as a required part of the lessons. They were also familiarized with the process necessary for the creation of a well-written story. This process was revised as a need arose for a smoother method with which to organize and sequence story writing. The utilization of three by five cards increased the accuracy of the application of the story writing process and was integrated into the instructional unit. A sample story was utilized to demonstrate the accuracy of the story writing process. After this initial instruction was implemented, the students were instructed to begin work with Transportation Transformation in the creation of their own contraptions and tales. It was at this point that a checklist was utilized to ascertain student performance as well as the attainment of the aforementioned techniques and skills. However, it must also be stated here that the checklist reflected the minimum performance required for competence. All students progressed far beyond this minimum as was evidenced in the

frequency of graphic choices reported in Table 9. As evidenced by the information reflected on the Checklist Analysis chart, Table 15, all students competently completed all levels determined through the checklist. Even though the aforementioned data reflected high completion levels, this was not meant to imply that all students completed the five levels during the same time span.

Table 16

Checklist Analysis
Completion Levels

Student Number	Level One	Level Two	Level Three	Level Four	Level Five
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X
4	X	X	X	X	X
5	X	X	X	X	X
6	X	X	X	X	X
7	X	X	X	X	X
8	X	X	X	X	X
9	X	X	X	X	X
10	X	X	X	X	X
11	X	X	X	X	X
12	X	X	X	X	X

It merely stated that each student completed all five levels necessary to report that the unit was accomplished successfully. Statistical data, in that each checklist reflected a totally checked and therefore completed unit of instruction supported the positive evaluation of this unit of instruction. See Table 16.

Behavior

At this level of evaluation, the instructor determined whether the unit of instruction had any relevant effect on the student's behavior. Once again, a major portion of this evaluation included

the utilization of a checklist. This checklist was the same checklist utilized by the instructor during the original series of lessons. At this time it was utilized after completion of the unit of instruction to determine whether the students were able to apply their newly acquired skills and techniques in the creation of other graphics without the utilization of a checklist. Through the utilization of a performance checklist as well as direct observation, it was clearly evident that the students demonstrated a mastery of the utilization of the graphic writing program Transportation Transformation. The checklist was once again utilized for the benefit of the instructor only. Additional programs were also made available to the students in which they were encouraged to apply their newly acquired skills. In fact, these original field trial subjects have encouraged and are continuing to encourage other children to visit the computer lab during lunch to utilize the graphic writing programs. This directly reflected a change in behavior in that ten out of twelve original field trial subjects have continued to visit the computer lab to utilize other graphic writing programs and have encouraged peers to do the same. Table 15 summarizes the aforementioned data.

Results

The final level of evaluation was entitled results. This evaluation dealt primarily with the effect of the instruction on the group or in this case the class or the entire school. A portion of the positive results of this unit have been already evidenced by the students encouragement of other students not only in their respective classes but in others as well to attend the

Table 15

Behavior Evaluation

Subject	Post Graphic Complete	Continues to Visit Lab	Encourages Peers Visit Lab
Student One	Yes	Yes	Yes
Student Two	Yes	Yes	Yes
Student Three	Yes	Yes	Yes
Student Four	Yes	Yes	No
Student Five	Yes	Yes	No
Student Six	Yes	Yes	Yes
Student Seven	Yes	Yes	Yes
Student Eight	Yes	Yes	Yes
Student Nine	Yes	Yes	Yes
Student Ten	Yes	Yes	No
Student Eleven	Yes	Yes	Yes
Student Twelve	Yes	Yes	Yes

computer lab during their lunch period to utilize the graphic writing programs. This motivation to write creative stories as well as create unique graphics proves definitely that this instruction did in fact have a positive effect on the students, their respective classes and in fact a major portion of the school population. Furthermore, a checklist may be utilized at a predetermined time in the future (or several predetermined times) to ascertain the students' application of these newly acquired skills and techniques as well as their effect on the group, class or school. This will offer concrete evaluation statistics with which to report accurate findings as well as provide the designer with further feedback as to the success of the unit. An expected outcome would be that the students actively utilize other graphic writing programs as well as exhibit an increase in their writing skills which would include sequencing and organization. It is also hoped that these students will continue to encourage their peers to

fine tune their writing skills and apply them through other writing mediums.

Learning Transfer

A variety of learning activities designed for the purpose of improving learner performance within the current education process can ultimately comprise a positive interaction between both traditional and sophisticated new technologies (Broad, 1988). Here, research indicates that in a multitude of instructional instances, relevant ways to improve the results of instruction are very often overlooked. In this project, the utilization of an innovative piece of technology, the computer, was encompassed to improve the results of instruction. This visible support for learning served to enhance the results of instruction. Broad (1988), also reports that with the integration of new technologies accompanied by positive teacher support, learners will exemplify marked improvements within the results of instruction.

Summary

Throughout the evaluation of this instructional unit, thorough analysis was conducted to ensure accurate revisions of the series of lessons. Relevant revisions were made as a result of analysis through the utilization of one-on-one, small group as well as field group evaluations. At the completion of this formative evaluation, a successful unit of instruction was attained. Data to directly support this level of evaluation was included.

At the conclusion of the formative evaluation, further evaluation was necessary. Thus the summative evaluation was

comprised of assessment on four separate levels of evaluation. These levels were those described by Kirkpatrick (1976) as reaction, learning, behavior and results. Each level was analyzed thoroughly so that an accurate assessment of the instructional unit was attained.

In conclusion, as supported by specific data, it can be stated that a successful unit of instruction was accomplished. This was reflected throughout the evaluation and was especially evident in the final level of evaluation entitled results.

CHAPTER 7

SUMMARY AND RECOMMENDATIONS

Introduction

In order to ensure the adequate report of this project, a chapter designated solely to its summarization is presented. The first chapter communicated the designer's expectations for the project in its entirety. In contrast, this final chapter strives to relay the actual events of this instructional unit. It begins with a brief discussion of the various methods and procedures utilized within the project. A section devoted to notable conclusions as well as further recommendations are included to encourage and guide other designers in the further application of this project. The designer also offers concluding statements in final reflection of the completed project.

Methods and Procedures Used

This project involved the creation of an instructional unit that engaged the utilization of an innovative piece of technology, the computer, and a graphic writing program, Transportation Transformation, to motivate learners to write as well as to increase their writing skills. Five stages were explored throughout this project: analysis, design, development, implementation, and evaluation.

Analysis

The primary procedures conducted within this stage involved the undertaking of a needs analysis, job task analysis, a target population analysis, and an analysis of the instructional goal. A

need for this instruction was based on a report offered by the Regents Action Plan in which it was stated that all elementary curriculum be updated to incorporate computer literacy and computer technology into the appropriate subjects. It was also suggested that word processing be included with instruction on writing (Decristofaro and Theyn, 1986). In compliance with the aforementioned plan, this unit of instruction was designed. It was designed to motivate students to write and to increase their writing skills through the utilization of a graphic writing program and a computer.

The target population consisted of fourth graders who were attending Birch Lane Elementary School, Massapequa, New York. A multi-level span of academic abilities was represented in which I.Q. scores ranged from 91 through 124 with a majority of the students falling between the interval of 100 and 120.

A graphic writing program, Transportation Transformation coupled with the utilization of an Apple IIE computer were the main media utilized within this project. The designer created a unit of instruction based on the utilization of the motivating program Transportation Transformation integrated with the reinforcement of a variety of writing skills. Through a thorough job task analysis, six main tasks were developed as well as their accompanying sub-tasks to ensure the accomplishment of the instructional goal. These main tasks involved loading the program, creating a contraption (transportation vehicle), writing a transportation tale, evaluating the transportation tale, editing the transportation tale and exiting the program.

The designer developed a timeline that enabled the project to remain on schedule and enabled the development of realistic goals. This timeline commenced on February 6, 1989 and was terminated on May 26, 1989. PERT and Gantt charts were also developed by the designer to locate any conflicts of time and to avoid any unnecessary interruptions.

At the conclusion of the analysis stage, a budget was constructed. This budget reflected the projected cost of implementing the instructional program. The budget exemplified a reasonable range of cost and was considered vital to the further application of this project.

Design

During the design stage, six main tasks were identified as essential in order to ensure the accomplishment of the instructional goal. Objectives were then designed to correspond with each of the six tasks and were placed in order according to their appropriate position within the design of the instructional unit. Performance conditions and criteria were stated as well as the initial design of specific desired learning time.

All learning activities were related directly to Gagne's (1985) nine internal processes and the primary media for utilization within this project was stated. Advantages and disadvantages for computer utilization were discussed and explored.

An entry behaviors test was utilized to determine prerequisite skills. Two checklists were utilized to ensure the accurate evaluation of the students participating in this project. One was constructed for the learner and a second similar one for the

instructor.

Evaluation was determined to be conducted on both the formative and summative levels. Learning transfer was discussed briefly as well as materials selected for inclusion in the instructional unit.

Development

The development of this instructional unit specifically utilized methods suggested by Dick and Carey (1985) to ensure the proper development of all materials. Each of Gagne's (1985) instructional events were related directly to specific learning activities as well as to specific methods and media. The estimated time allotment of six forty-minute sessions was accurate.

A complete review of all essential materials was undertaken with favorable results. The instructional package was reviewed for accuracy of content, appropriate sequence of instruction, clarity of directions, accuracy of checklists, correct spelling, and suitable format by several professional persons including two supervisors, a fourth grade classroom teacher and a computer supervisor. Materials, which included a student checklist, instructor checklist and an attitude questionnaire, were then reproduced.

Implementation

Implementation enabled the designer to evaluate and revise all instructional materials to ensure the improvement of the quality of instruction. The revised instruction was utilized by the learners throughout the entire stage. Thirteen copies of the materials were then produced. The implementation of this project then began on April 12, 1989.

Implementation of this project involved a combination of class activity and individual work. Data was collected throughout this stage for utilization in the summative evaluation.

Evaluation

Throughout the evaluation of this instructional unit, thorough analysis was conducted to ensure accurate revisions of the series of lessons. Relevant revisions were made as a result of analysis through the utilization of one-on-one, small group as well as field group evaluations. Data to support the success of the instructional unit was recorded and analyzed.

At the conclusion of the formative evaluation, further evaluation was necessary. Thus the summative level of evaluation was comprised of assessment on four separate levels of evaluation: reaction, learning, behavior, and results. Checklists and attitude questionnaires were analyzed and reported in relation to the determination of the value of instruction for the target population.

As a result of the aforementioned forms of evaluation, the designer was able to ascertain that all necessary reliability and validity measurements were met.

Conclusions

The designer evaluated this unit to be a successful unit of instruction as supported by a variety of data cited throughout this project. All learners thoroughly enjoyed utilizing the software Transportation Transformation and the accompanying Apple IIE computers. Truly creative contraptions were constructed where learners exceeded well beyond the minimum performance necessary for

successful completion of the instructional goal. Transportation Tales were well-written and of varying length. The software chosen proved to be formidable in that it successfully met the needs of students on a variety of academic levels. This attribute was deemed essential to the designer because each and every classroom represents a wide spectrum of academic skills in which at-risk students are a vital part. Thus, a program that meets the needs of all the learners regardless of academic level which can be integrated within the traditional classroom is of surmountable use. Transportation Transformation also provided naturally for enrichment as well as for remediation within the design of the program. The designer realized that the appropriate software choice had been made which directly contributed to this unit's success.

The designer was also receptive to the results of the appropriate checklists and attitude questionnaire that further supported the success of the unit. As a result of this success, other professionals have supported the utilization of graphic writing programs to motivate students to write as well as to increase their writing skills.

Recommendations

1) Although this unit of instruction may be applicable to a wide spectrum of learners, the actual target population must be utilized to ensure the production of viable results. Alternate reproductions of this unit with dissimilar target populations may produce inconclusive results.

2) Evaluate the variety of academic levels within the fourth

grade target group to determine the size of the at-risk population.

3) Utilization of software similar to the one utilized within this project may be appropriate given the rapid obsolescence of contemporary programs.

4) This unit may be applied easily within an existing unit relating to the reinforcement of writing skills essential to the development of a firm foundation for further utilization of the writing process.

5) Expect the unexpected. Mechanical problems involving the utilization of computers are prevalent at the most inopportune times and must be compensated for at some point of instruction.

Concluding Statement

The instructional design described within this document provided the designer with a challenge that proved to be a stimulating experience. This challenge encompassed a considerable amount of valuable time in order to ensure the proper progression through the five instructional system design stages prevalent throughout this document. The analysis undertaken here proved clearly that a very definite need was met with a variety of favorable results. Learners were motivated to write as well as to increase their writing skills through the development of the writing process. The computer coupled with the program entitled Transportation Transformation motivated the students to write, provided natural applications for enrichment and remediation and enabled this unit to be utilized by learners functioning at a variety of academic levels. In a time when at-risk students are very often thrust into an environment which may or may not be

conducive to beneficial learning, this program affords the instructor the ability to apply the writing process within the traditional classroom to all learners regardless of academic proficiency or risk. The designer deemed this postulation to be the most prominent reason for this unit's development and ultimate success. Therefore, the completion of this project enabled the designer to gain valuable insight into the learning needs of the students as well as the opportunity to provide greater experience in the meeting of those needs.

APPENDIX A

Tasks

Task and Performance Objectives

GOAL: Given the graphic writing program "Transportation Transformation", the student will build a contraption (transportation vehicle) and will write a completed Transportation Tale. The Tale must be proofed, edited, saved, and printed.

Task	Performance Objective
1.0)) Load the program	1.0) Given an Apple IIE computer and a specific piece of software, Transportation Transportation, load the software into the computer. The words Transportation Transformation must appear on the monitor.
1.1) Open the disk drive door.	Given a 5.25 disk drive, open the door.
1.2) Place the disk into the drive slot 1.	1.2) Given an Apple IIE disk computer, a 5.25 disk drive and the software program Transportation Transformation, insert the disk into the disk drive, slot 1. The disk must be inserted so that the label is facing up.
1.3) Close the disk drive	1.3) Given an Apple 5.25 disk

door	drive, close the disk drive door. The disk drive door must be completely closed.
1.4) Turn on the monitor	1.4) Given an Apple monitor, turn the power switch on. The power light must be on.
1.5) Turn on the computer	1.5) Given an Apple IIE, turn on the computer. The power switch and power light must be on.
2.0) Create a contraption	2.0) Given an Apple IIE computer with a 5.25 disk drive and the loaded graphic writing program Transportation Transformation, create a contraption (transportation vehicle). The contraption must include a background and body shop parts.
2.1) Select a background for the contraption	2.1) Given an Apple IIe, and the loaded software Transportation Transformation, select one background.
2.2) Select Body Shop Parts	2.2) Given an Apple IIE Computer and the Transportation Transformation software, select Body Shop Parts. At least three

	Body Shop Parts, a body, wheels, and a driver must be selected.
2.3) Locate and select: Bodies Wheels Shapes Windows Decals Drivers Motors Fenders Wings Propellers Misc 1-2	2.3) Given an Apple IIE and the loaded software program Transportation Transformation, locate and select at least one body, wheels, and a driver from the Body Parts Menu.
2.4) Describe the Main Menu and its function	2.4) Given a sheet of paper and in your own words, write a definition of a Main Menu. The definition must include the functions of the Main Menu.
2.5) Locate specified keys on keyboard: Reset, Esc, Control, Shift, Capslock, open spacebar, arrow, Return, Delete, alphabet, number and punctuation keys.	2.5) Given an Apple IIE the computer and keyboard, locate and touch the Reset, Esc, apple, Control, Shift, Capslock, open apple, spacebar, arrow, Return, Delete, alphabet, number and punctuation keys.
3.0) Write a Transportation Tale	3.0) Given an Apple IIE computer and the loaded software program Transportation Transformation, write a completed Transportation Tale. An ordered series of complete

	sentences with correct punctuation must be written.
3.1) Choose a topic for the Transportation Tale	3.1) Given a sheet of lined paper, write an idea or topic for the Transportation Tale. The tale must be related to the contraption.
3.2) State the main ideas or points to be included in the tale	3.2) Given a sheet of lined paper, list the main ideas in order of presentation in the tale.
3.3) List the main ideas in order of presentation in the tale	3.3) Given a sheet of lined paper, list the main ideas in order of presentation in the tale.
3.4) For each main idea, write complete sentence	3.4) Given an ordered list of a main ideas and a sheet of lined paper, write complete sentences. One sentence must be written for each main idea.
3.5) For each main idea write supporting details in complete sentences	3.5) Given a list of main ideas, complete sentences and a sheet of lined paper, write additional complete sentences. Additional sentences must support the main ideas and sentences.

3.6) Write the first draft of the Transportation Tale	3.6) Given an Apple IIE computer, the loaded software program Transportation Transformation, in your own words write a first draft of the Transportation Tale. Complete sentences and correct punctuation must be written.
4.0) Evaluate the Transportation Tale	4.0) Given an Apple IIE of the computer, the loaded software program Transportation Transformation and a completed draft of the Transportation Tale, evaluate the tale. The tale must be proof-read. Incorrect words and sentences must be identified.
4.1) Proof-read the Transportation Tale	4.1) Given an Apple IIE computer, the loaded software program Transportation Transformation and the first draft of the Transportation Tale, proof-read the Tale. The proof-reading must include the identification of mistakes.
4.2) Identify misspelled words	4.2) Given an Apple IIE words computer, the loaded software

	program Transportation Transformation and a completed first draft, locate misspelled words.
4.3) Identify incorrect sentences	Given an Apple IIe computer, the loaded software program Transportation Transformation and a completed first draft of the Transportation Tale, locate incorrect sentence.
4.4) Spell words correctly	4.4) Given a sheet of lined paper and a dictionary, write misspelled words correctly.
4.5) Write sentences correctly	4.5) Given a sheet of lined paper, write complete sentences.
4.6) Identify complete and incomplete sentences	4.6) Given a list of complete and incomplete sentences, locate those that are complete.
5.0) Edit the Transportation Tale	5.0) Given an Apple IIE computer, the loaded software program Transportation Transformation and a proof-read draft of the tale, delete a letter or a group of letters.
5.1) Name commands used to delete a letter	5.1) Given a sheet of paper, list the commands to delete a

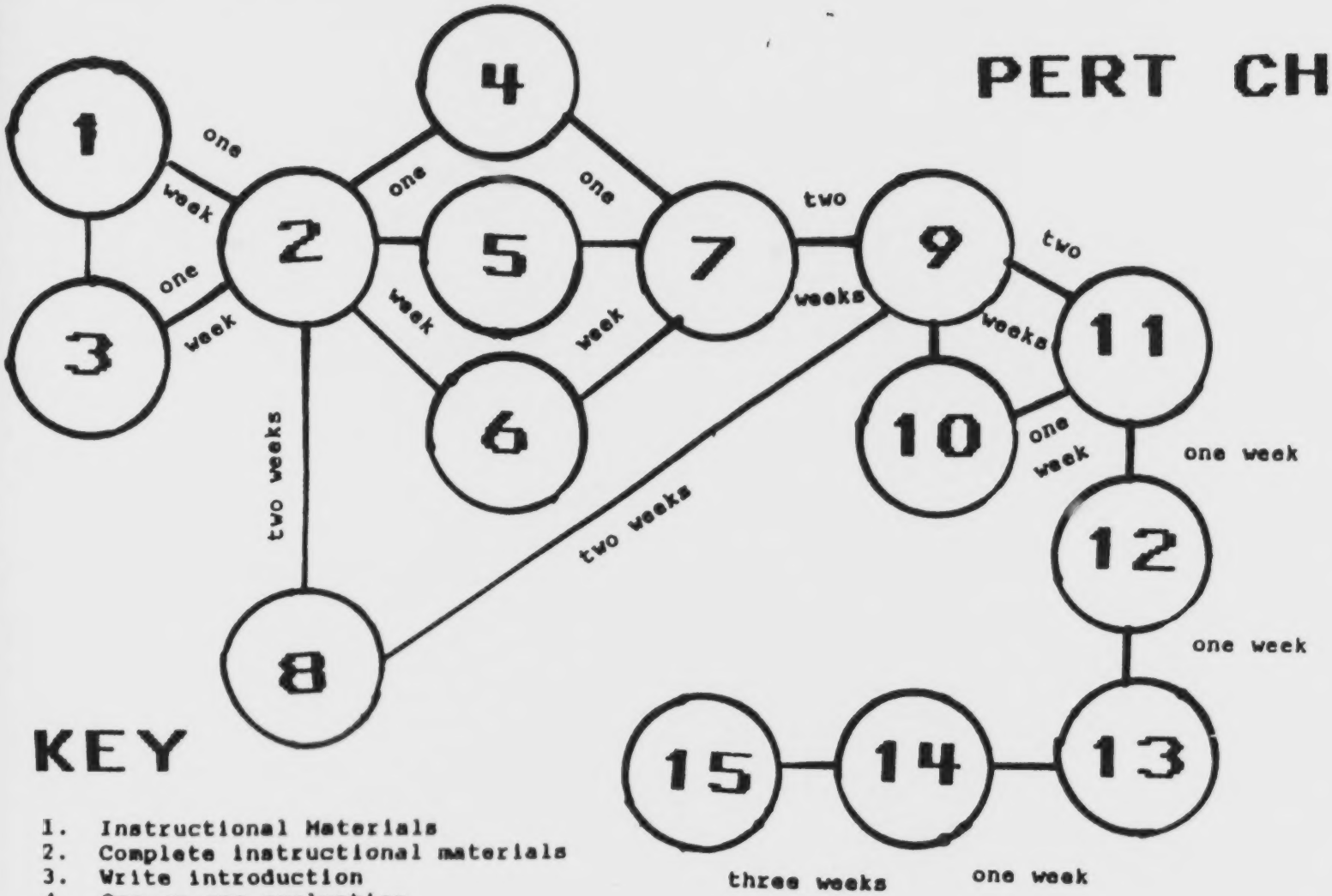
	letter.
5.2) Name commands used to insert a letter	5.2) Given a sheet of paper, list the commands used to insert a letter.
5.3) Delete a letter or a group of letters.	5.3) Given an Apple IIE computer, the loaded software program Transportation Transformation and a proof-read draft of the Tale, delete a letter or a group of letters.
5.4) Insert a letter or a group of letters	5.4) Given an Apple IIE computer, the loaded software program Transportation Transformation and a proof-read draft of the tale, insert a letter or a group of letters.
6.0) Exit the program	6.0) Given an Apple IIE computer, the loaded software program Transportation Transformation, quit the program. The software must be extracted from the disk drive and no power lights must be on.
6.1) Save	6.1) Given an Apple IIE computer, the loaded software program Transportation Transformation and a completed

	tale, save the tale. The main menu must be used.
6.2) Print	6.2) Given an Apple IIE computer, the loaded software program Transportation Transformation and a completed saved tale, print the tale. The print must be near letter quality and the paper must be aligned.
6.3) Quit	6.3) Given an Apple IIE computer, the loaded software program Transportation Transformation and a completed, saved, printed Transportation Tale, quit the program. The main menu must be used.
6.4) Turn off the monitor	6.4) Given an Apple monitor, turn the power switch off. The power light must be off.
6.5) Turn of the computer	6.5) Given an Apple IIE computer, turn the power switch off. The power light must be off.

APPENDIX B

Project Planning

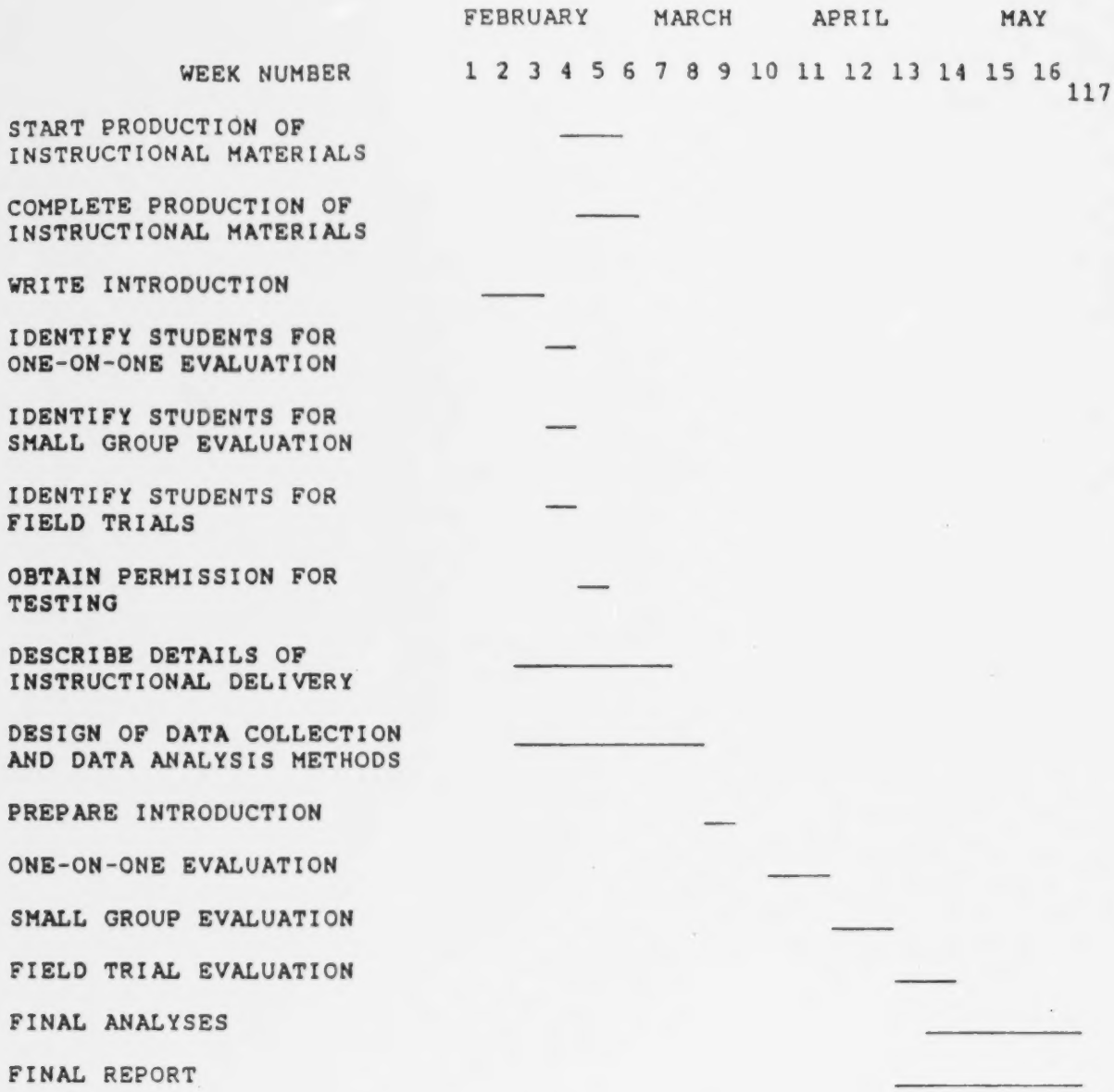
PERT CHART



KEY

1. Instructional Materials
2. Complete instructional materials
3. Write introduction
4. One-on-one evaluation
5. Small group evaluation
6. Field trials
7. Permission / Testing
8. Instructional Delivery
9. Data collection analysis
10. Prepare introduction
11. One-on-one evaluation
12. Small group evaluation
13. Field trial analysis & revision
14. Final analysis
15. Final Report

TIME LINE


FEBRUARY
MARCH
APRIL
MAY
WEEK NUMBER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
START PRODUCTION OF INSTRUCTIONAL MATERIALS
COMPLETE PRODUCTION OF INSTRUCTIONAL MATERIALS
WRITE INTRODUCTION
IDENTIFY STUDENTS FOR ONE-ON-ONE EVALUATION
IDENTIFY STUDENTS FOR SMALL GROUP EVALUATION
IDENTIFY STUDENTS FOR FIELD TRIALS
OBTAIN PERMISSION FOR TESTING
DESCRIBE DETAILS OF INSTRUCTIONAL DELIVERY
DESIGN OF DATA COLLECTION AND DATA ANALYSIS METHODS
PREPARE INTRODUCTION
ONE-ON-ONE EVALUATION
SMALL GROUP EVALUATION
FIELD TRIAL EVALUATION
FINAL ANALYSES
FINAL REPORT

APPENDIX C

Learner Performance Checklist

NAME_____ DATE_____

STUDENT CHECKLIST

Check each line as soon as you complete each task. You must complete each task in the order given. Do not check the line next to each number until you have completed everything beneath it.

I:

____1. Loaded the program

____opened the disk drive door

____placed the disk properly into the disk drive slot 1

____closed the disk drive door

____turned on the monitor

____turned on the printer

____turned on the computer

____2. Created a Contraption

____selected a background for the contraption

____selected body shop parts

____selected a body

____selected wheels

____selected a driver

____3. Wrote a Transportation Tale

____chose a topic for the Transportation Tale

____stated the main ideas to be included in the Tale

____listed the main ideas in order of presentation in the Tale

____wrote a complete sentence for each main idea

____wrote supporting details in complete sentences for each main idea

____wrote the first draft of the Transportation Tale

____4. Edited the Transportation Tale

____proof-read the Transportation Tale

____found all misspelled words

____found all incorrect sentences

____spelled all words correctly

____wrote complete sentences

____5. Exited the program

____saved the Tale

____printed the Tale

____quitted the program

____removed the disk properly

____turned off the monitor

____turned off the printer

____turned off the computer

APPENDIX D

Instructor Performance Checklist

Checklist

Student's Name_____Date_____

Directions: Check the appropriate space to indicate if the student performed the specified task.

The student:

____1. Loaded the program

- ____opened the disk drive door
- ____placed the disk properly into the disk drive slot 1
- ____closed the disk drive door
- ____turned on the monitor
- ____turned on the printer
- ____turned on the computer

____2. Created a Contraption

- ____selected a background for the contraption
- ____selected body shop parts
  - ____selected body
  - ____selected wheels
  - ____selected driver
- ____described the main menu and its functions
- ____located specified keys on the keyboard
  - ____Reset
  - ____Esc
  - ____Control
  - ____Shift

____Capslock

____open apple

____spacebar

____arrow

____Return

____Delete

____alphabet

____number

____punctuation

____3. Wrote a Transportation Tale

____chose a topic for the Transportation Tale

____stated the main ideas to be included in the Tale

____listed the main ideas in order of presentation in the Tale

____wrote a complete sentence for each main idea

____wrote supporting details in complete sentences for each main idea

____wrote the first draft of the Transportation Tale

____4. Evaluated the Tale

____proof-read the Transportation Tale

____identified misspelled words

____identified incorrect sentences

____spelled words correctly

____wrote complete sentences

____5. Edited the Transportation Tale

____named commands used to delete a letter

____named commands used to insert a letter

____deleted a letter or a group of letters

____inserted a letter or a group of letters

____6. Exited the program

____saved the document

____printed the document

____quitted the program

____removed the disk properly

____turned off the monitor

____turned off the printer

____turned off the computer

APPENDIX E

Attitude Questionnaire

NAME_____ DATE_____

ATTITUDE QUESTIONNAIRE

Please answer the following questions to help us understand what you think about the lessons on writing and the use of the software program Transportation Transformation.

A. MOTIVATION

1. How much did you enjoy viewing the enlarged picture of a completed Contraption?

____very much ____somewhat ____not at all

2. Did the images of the program Transportation Transformation interest you in using computers?

____very much ____somewhat ____not at all

3. How helpful was it to you to also see program on the large television monitor?

____very helpful ____somewhat helpful____ not helpful

4. How eager were you to participate in this series of lessons?

____very eager ____somewhat eager ____not eager

B. OBJECTIVES

1. Was it clear that you were going to use Transportation Transformation to write a creative story?

____very clear ____somewhat clear ____not clear

2. How well did you understand the steps that you were going to use to create a Contraption?

____very well ____somewhat ____not at all

3. How well did you understand the steps necessary for

the creation of a well written story?

____very well ____somewhat ____not at all

C. ENTRY BEHAVIORS

1. Did you already know how to load a computer program?

____yes ____a little ____no

2. Did you already know how to use a main menu ?

____yes ____a little ____no

3. Did you have any trouble locating any specific keys on the keyboard?

____no trouble

____a little trouble

____a great deal of trouble

4. Did you have any trouble quitting the program?

____no trouble

____a little trouble

____a great deal of trouble

D. TESTS

1. Was it easy to follow the checklist?

____very easy ____somewhat easy ____ not easy

2. How clear were the statements on the checklist?

____very clear ____somewhat clear ____not clear

E. INSTRUCTION

1. Did you enjoy creating a Contraption? (transportation vehicle)

____very much ____somewhat ____not at all

2. Did you enjoy writing a Transportation Tale?

____very much ____somewhat ____not at all

3. Did you think the story we created together was

interesting?

____very interesting

_____somewhat interesting

____not interesting

4. Did you find the directions clear and easy to follow?

____very clear ____somewhat clear ____not clear

5. Was the sample story helpful?

____very helpful ____somewhat helpful ____not helpful

6. Did you find breaking up the story into its main parts helpful?

____very helpful ____somewhat helpful ____not helpful

7. Was the software program Transportation Transformation easy to follow?

____very easy ____somewhat easy ____not easy

8. Did creating the Contraption and Transportation Tale make you want to try to write more interesting stories yourself?

____many stories ____a few stories ___no stories

F. GENERAL

1. Generally, did you like the lesson?

____very much ____somewhat ____not at all

2. Did you learn to do things that you couldn't do before?

____many things ____ a few things ____nothing

3. What do you think would improve the lesson most?

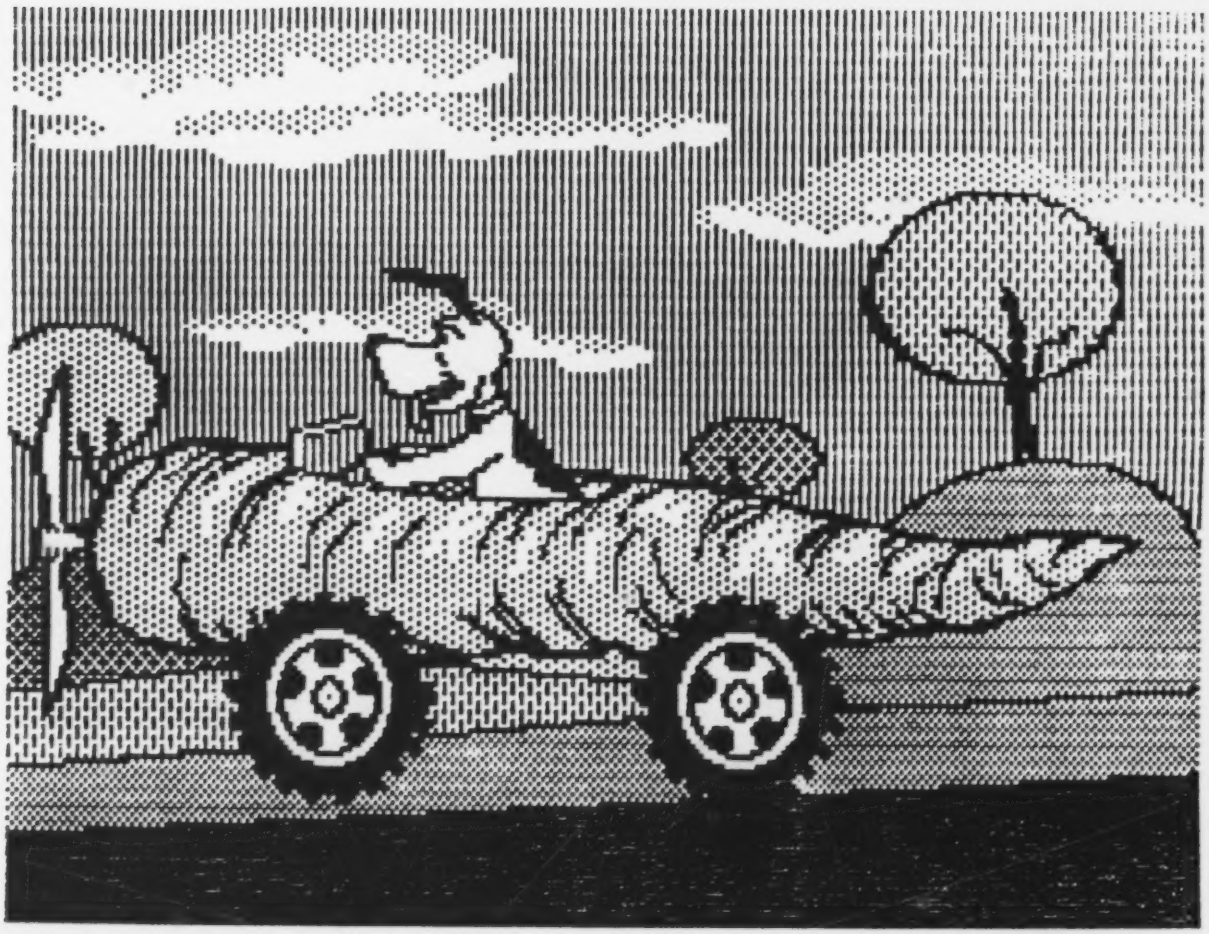
_____

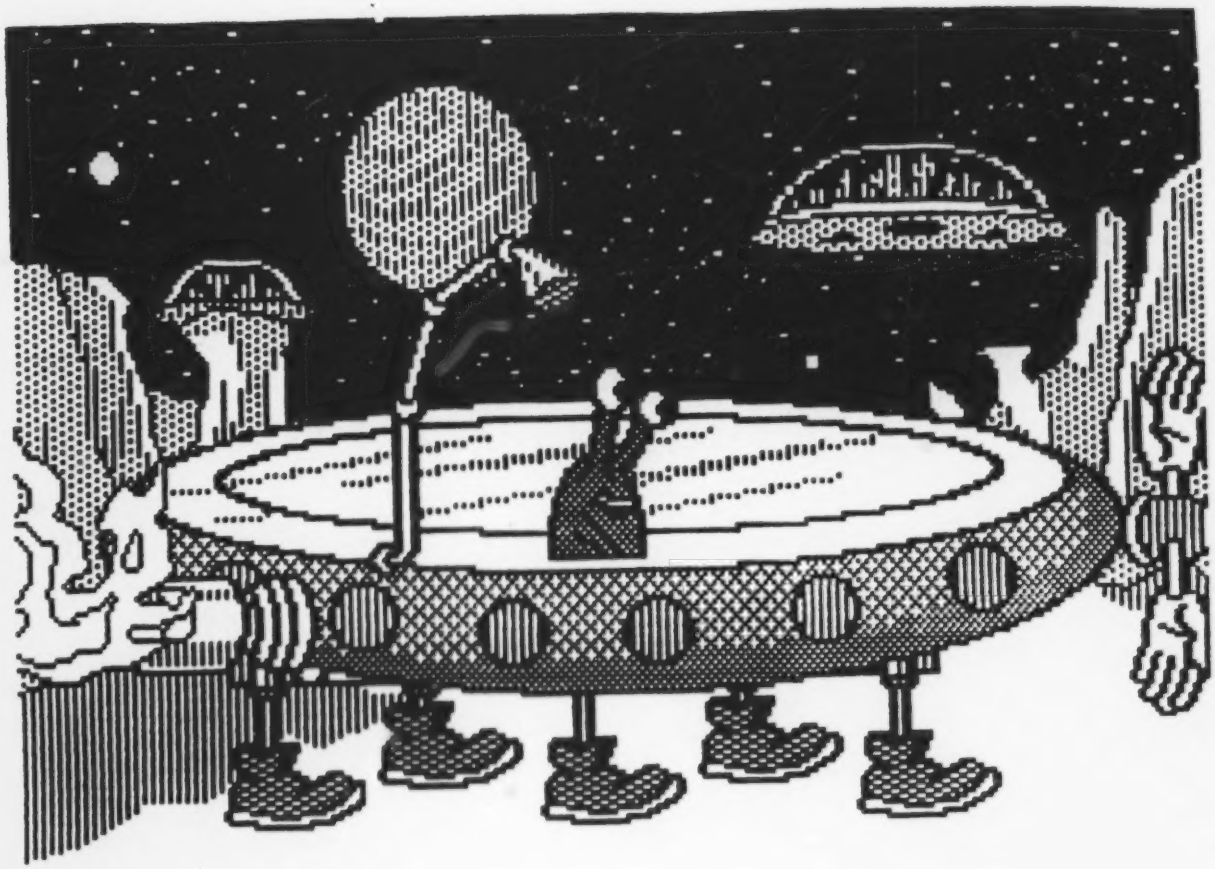
_____

_____

APPENDIX F

Sample Contraptions





APPENDIX G

Story Chart

** STORY CHART **

WRITE THE BEST STORY THAT YOU CAN WRITE BY FOLLOWING THIS SIMPLE OUTLINE. TRY IT!!! WRITING HAS NEVER BEEN SO EASY!!

TOPIC

MAIN IDEA MAIN IDEA

COMPLETE SENTENCE COMPLETE SENTENCE

SUPPORTING DETAILS SUPPORTING DETAILS

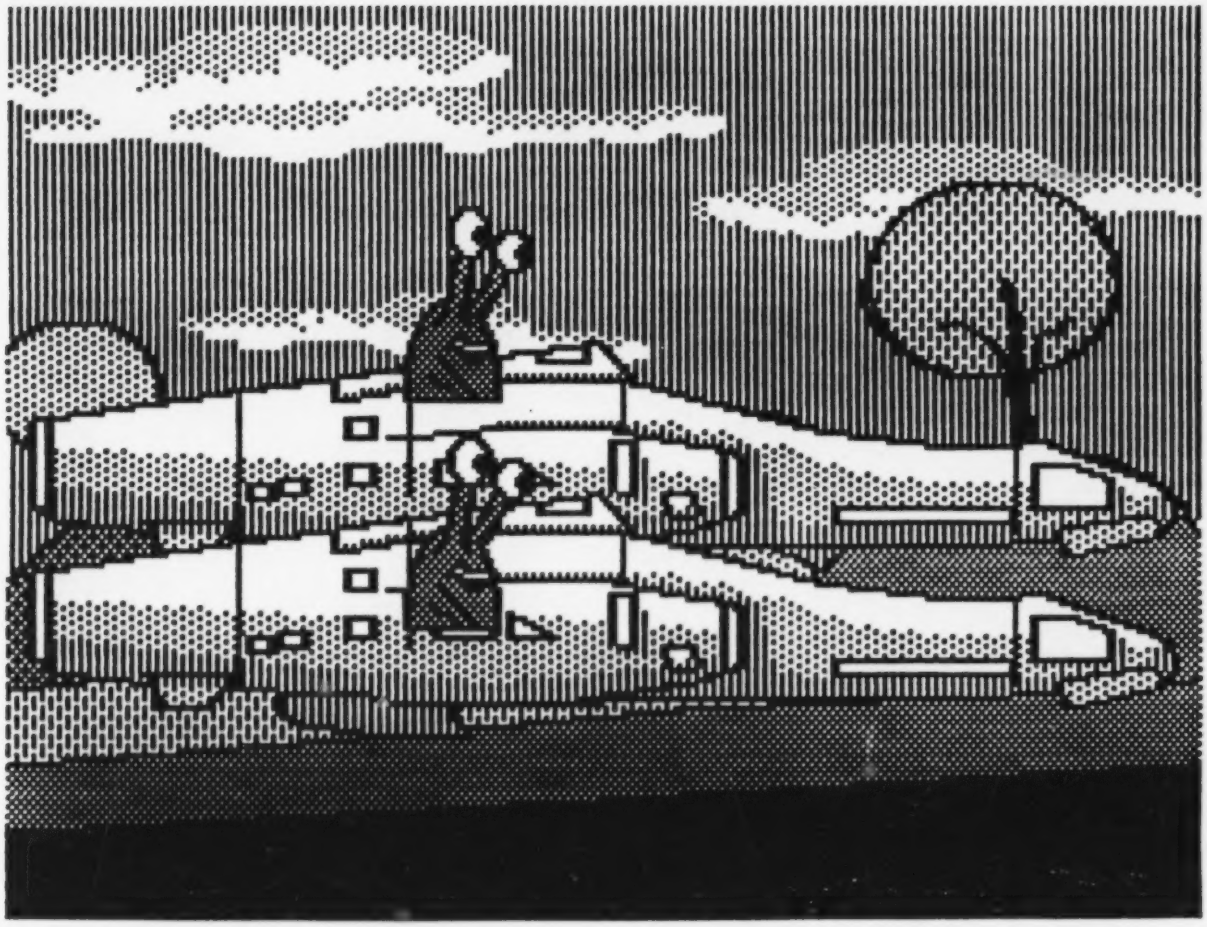
NOW THAT YOU HAVE ORGANIZED ALL OF YOUR INFORMATION, WRITE A FIRST DRAFT OF YOUR TOPIC.

ENJOY!!!! HAVE FUN!!!!

APPENDIX H

Sample Print Sizes

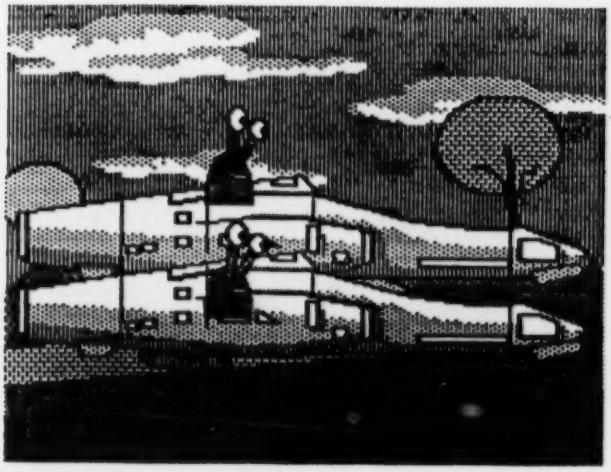
Standard Size Print



It was such a pleasant day when I first awoke. The birds were chirping at my window and the air smelled fresh. I knew that I did not have to get out of bed since it was Saturday. But, the quiet did not last very long. I was suddenly woken out of my sleep by the sound of a low flying airplane. Well, was I surprised to find out that it wasn't an airplane at all! It was a pair of aliens driving around in super jets. They were circling my house. I found out that their names were Frick and Frack. Frick and Frack were brothers from the planet Frankfurter. They took me to their planet and I ate the best frankfurters ever! How they come back to visit me all the time and they have even tried Earth food!

By Christopher

Small Size Print



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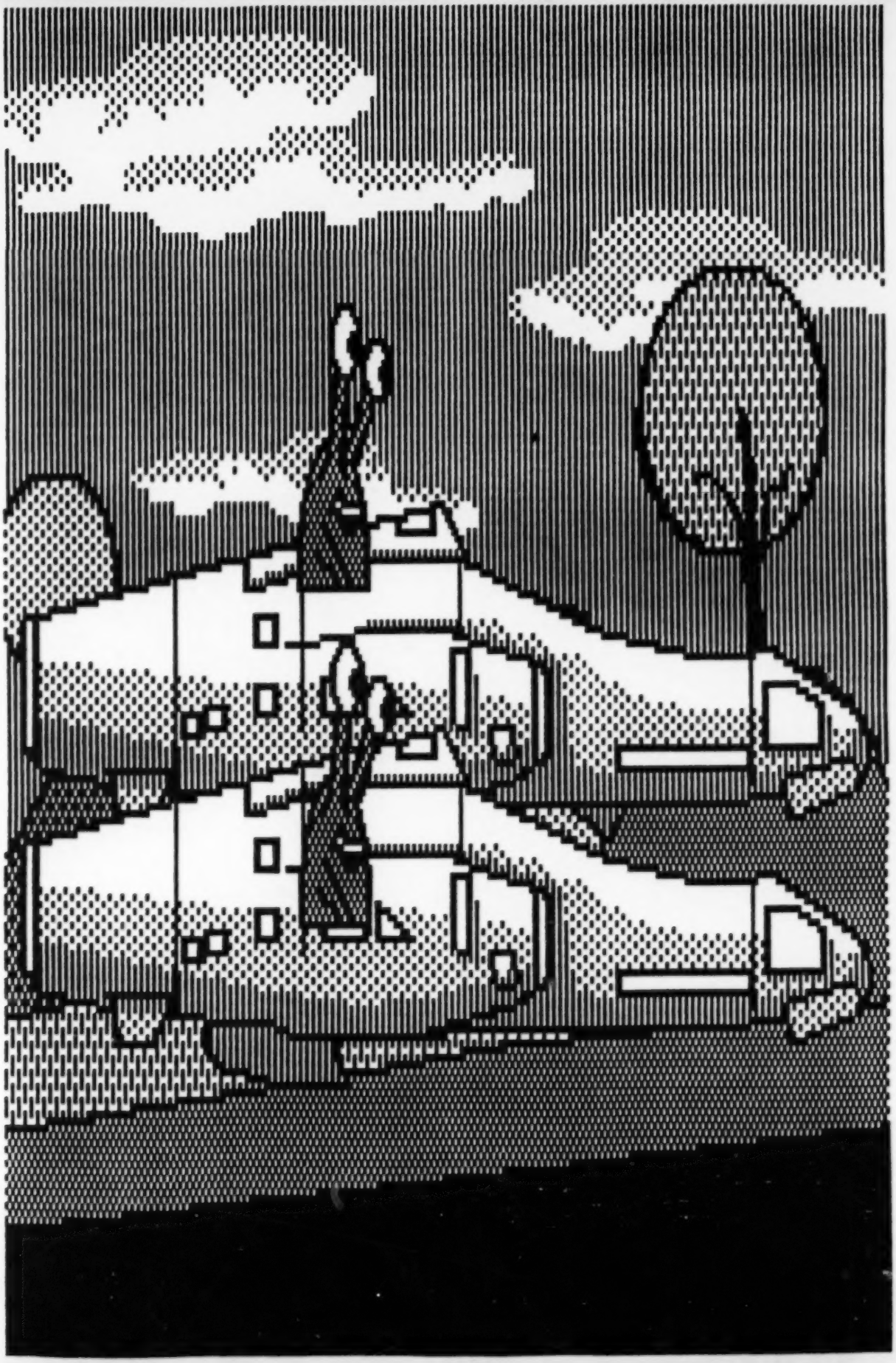
By Christopher



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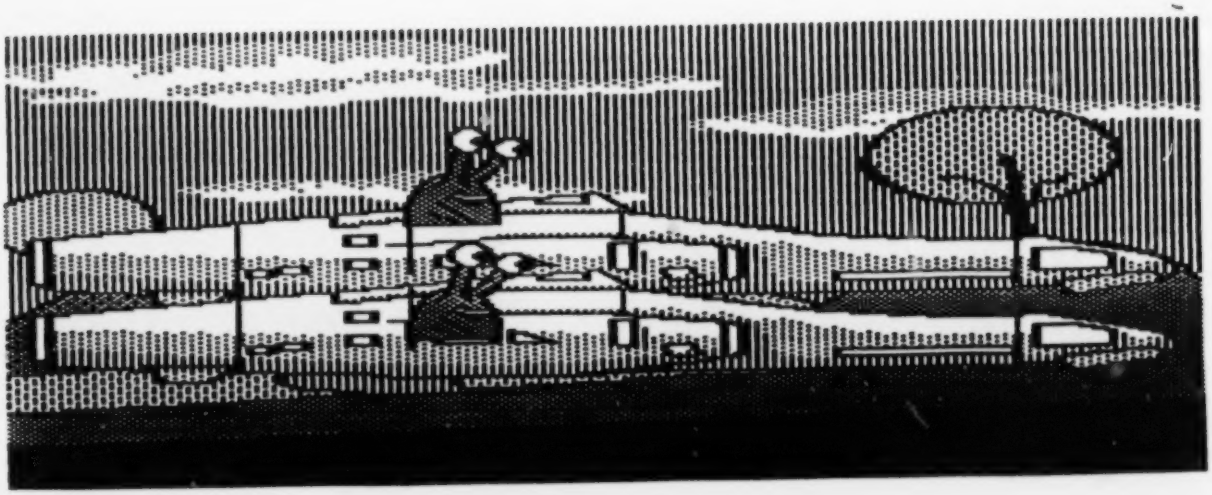
By Christopher

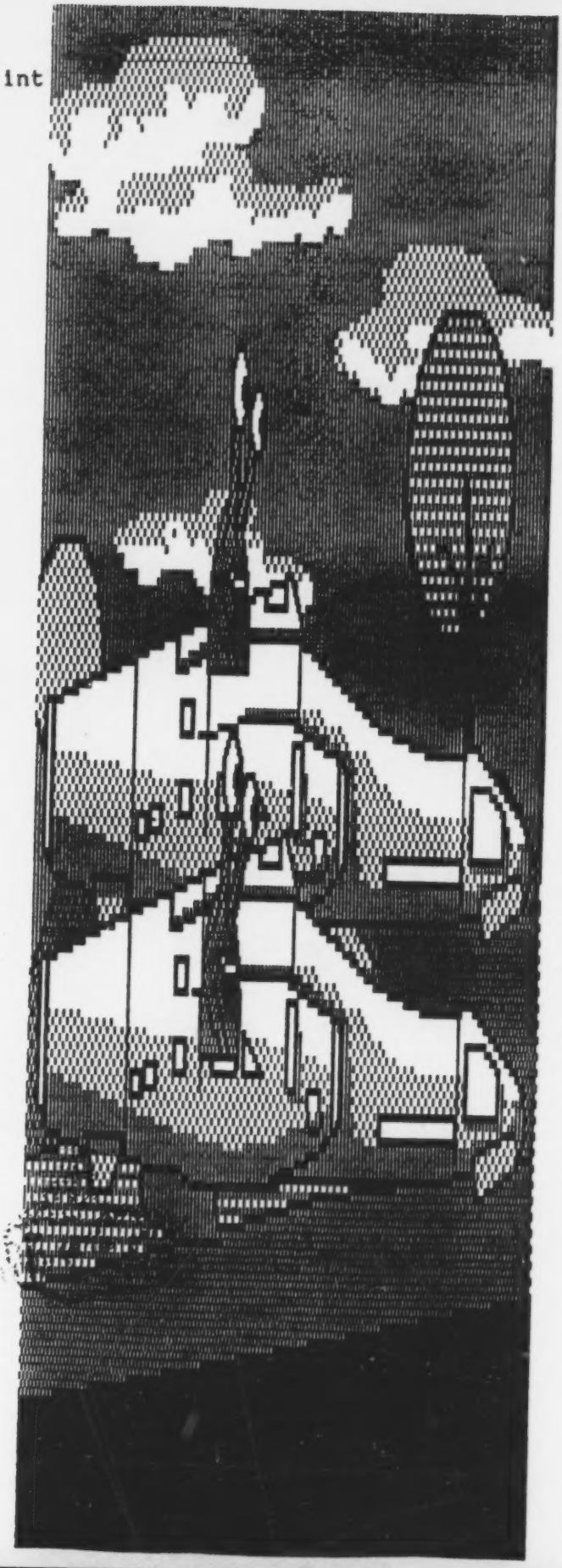
Short Size Print



It was such a pleasant day when I first awoke. The birds were chirping at my window and the air smelled fresh. I knew that I did not have to get out of bed since it was Saturday. But, the quiet did not last very long. I was suddenly woken out of my sleep by the sound of a low flying airplane. Well, I was surprised to find out that it wasn't an airplane at all! It was a pair of aliens driving around in super jets. They were circling my house. I found out that their names were Frick and Frack. Frick and Frack were brothers from the planet Frankfurter. They took me to their planet and I ate the best frankfurters ever! Now they come back to visit me all the time and they have even tried Earth food!

By Christopher

Tall Size Print



It was such a pleasant day when I first awoke. The birds were chirping at my window and the air smelled fresh. I knew that I did not have to get out of bed since it was Saturday. But, the quiet did not last very long. I was suddenly woken out of my sleep by the sound of a low flying airplane. Well, was I surprised to find out that it wasn't an airplane at all! It was a pair of aliens driving around in super jets. They were circling my house. I found out that their names were Frick and Frack. Frick and Frack were brothers from the planet Frankfurter. They took me to their planet and I ate the best frankfurters ever! Now they come back to visit me all the time and they have even tried Earth food!

By Christopher

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